



74-1  
HSL No. 74-1

JANUARY 16, 1974

THIS ISSUE CONTAINS:

HS-013 604 - HS-013 653; HS-800 720; 827-829; 874-876;  
882; 884; 888; 893; 897; 903-904; 909-910; 913-914; 916;  
918; 920-921; 925. HS-820 270-275; HS-845 021

U.S. Department of  
Transportation

National Highway  
Traffic Safety  
Administration



*Shelve in Stacks  
S.B.T.*

# Highway Safety Literature

... A SEMI-MONTHLY ABSTRACT JOURNAL

## AVAILABILITY OF DOCUMENTS

Documents listed in **Highway Safety Literature** are **not** available from the National Highway Traffic Safety Administration. They must be ordered from the sources indicated on the citations, usually at cost. Ordering information for each of the sources is listed below.

**NTIS:** National Technical Information Service, Springfield, Va. 22151. **Order by title and accession number: PB, AD, or HS.**

**GPO:** Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. **Give corporate author, title, personal author, and report number.**

**Corporate author:** Contact corporate author.

**Reference copy only:** Consult your librarian.

**See serial citation:** Obtain through normal loan or purchase.

**SAE:** Society of Automotive Engineers, Dept. HSL, 2 Pennsylvania Plaza, New York, N.Y. 10001. **Order by title and SAE report numbers.**

**HRB:** Highway Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

Material directly related to Highway and/or Motor Vehicle Safety is solicited for inclusion in Highway Safety Literature. Topics must fall within the scope of the mission of the National Highway Traffic Safety Administration. Submit material, together with a written statement of approval for publication to:

Office of Administrative Services (N48-50)  
National Highway Traffic  
Safety Administration  
400 7th Street, S.W.  
Washington, D.C. 20590

Please indicate availability source and price for the material.

**Special notice:** Material published in HSL is intended only for information. References to brand names, equipment models or companies does not imply endorsement by the NHTSA or the U.S. Department of Transportation.

U.S. SUPT. OF DOCS.

Entries in **Highway Safety Literature** are arranged in numerical order by HS accession number. Documents related directly to the National Highway Traffic Safety Administration (NHTSA) are numbered according to the following series: Accident Investigation Reports HS 600 000; Compliance Test Reports HS 610 000; Contractor's Reports HS 800 000; Staff speeches, papers, etc. HS 810 000; Imprints HS 820 000.

A document containing several articles is announced as complete volume under an HS number referring to it as a whole. Entries for individual articles are listed under their own HS numbers.

## SAMPLE ENTRIES

**JOURNAL ENTRY**

**Title of Document** { **SYNTHESIS OF CASE LAW JURISPRUDENCE RELATING TO WET-WEATHER HIGHWAY CONDITIONS**

**Journal Citation** → Highway Research Record n 376 p29-36 (1971)

**Author(s)** → D. C. Oliver 1971  
Sponsored by Highway Res. Board Steering Com. for Workshop on Anti-Skid Program Management and presented at the workshop.

**Search Terms** { Descriptors: \*Liability, \*Negligence, \*Accident responsibility, \*Legal responsibility, \*Wet road conditions, \*Court decisions, \*State government, \*Skidding accidents, \*Warning signs, \*Highway maintenance, \*Litigation, \*Icy road conditions,

**Abstract** { The extant case law on legal liability for accidents occurring on icy and wet highways has established three central areas and one subarea in the jurisprudence of maintenance liability. These areas are compliance with general duties in order to escape liability; damages resulting from noncompliance (negligence); contributory negligence as a bar to recovery; and advisory signing as a technique in meeting general duties. Court decisions covering these four areas are presented.

**NHTSA Accession Number** → HS-012 289  
\*Subject heading in Subject Index

**CONTRACT REPORT**

**EQUIPMENT AND PROCEDURES FOR MEASURING GLARE FOR MOTOR VEHICLES. FINAL REPORT**

**Corporate author** → Teledyne Brown Engineering  
N. E. Chatterton J. D. Hayes E. W. George 1972 102p  
Contract DOT-HS-089-1-139

**Availability** → NTIS

Descriptors: \*Glare, \*Glare reduction, \*Visual perception, \*Photometers, \*Luminance, \*Hydraulic equipment, \*Central vision, \*Field of view, \*Backgrounds, \*Contrast, \*Light conditions, \*Brightness, \*Test facilities, \*Test equipment, \*Vehicle safety standards, \*Simulators, \*Light, \*Reflectance, \*Measuring instruments,

A procedure and description of equipment for measuring glare from a driver's own vehicle are presented. The procedures are based on a disability glare theory as applied to foveal vision. Two pieces of apparatus were constructed to provide the measurement capability. One of them simulates diffuse sky glare and the other simulates direct solar glare. Methods of combining data from these measurements are presented along with scaling laws selected to provide a value for glare as it would be under natural daylight conditions. A standard for allowable glare levels from the vehicle is developed which is independent of the measurement procedure. Test results from a passenger car are presented and compared with this standard. Recommendations for improvements to the apparatus and additional research requirements for improvement to the theory are made.

HS-800 731

\*Subject heading in Subject Index

**EMERGENCY MEDICAL SERVICES: CRASH INJURY  
MANAGEMENT FOR TRAFFIC LAW  
ENFORCEMENT OFFICERS. FINAL REPORT**

Dunlap and Associates, Inc., Darien, Conn.  
A. M. Clevon, J. T. Fucigna 1973 36p 8refs  
Contract DOT-HS-099-3-570  
Report for 20 Nov 1972-20 Jun 1973.  
NTIS

Emergency medical services, Police training, Emergency training, Curricula, Emergency equipment

A basic training program was developed to provide training in emergency medical care for first responders to traffic accidents. Such individuals are expected to be law enforcement officers. Twenty lessons were developed for the course. These include technical lessons, field training, review sessions, and examinations. Course length is 40 hours. The primary course emphasis and the majority of training time are devoted to life-threatening emergencies and caring for injuries/conditions that are crash-related. For purposes of determining level of course detail, it was assumed that the trainee has no previous emergency medical care training or experience. The course was designed in modular form so that it may be spread out over several weeks in a recruit training program or may be given in a compressed time frame. Course design documentation and results of a pilot test of the course are outlined.  
HS-800 897

**DESIGN MANUAL FOR STATE TRAFFIC RECORDS  
SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS  
AND CODING. SECT. 5, EMERGENCY SERVICES  
DATA SUBSYSTEM  
65P  
GPO**

Information system design, Computerized records management, Coding systems, Data processing, Emergency medical services, Manuals, Emergency services, State planning, Traffic records

The Emergency Services Data Subsystem of the State Traffic Records System is designed to maintain an inventory of available organizations providing emergency services in response to traffic accidents and other emergency events on a State-wide basis; permit effective monitoring of the operations of the emergency services organizations in response to emergency situations; provide support to State agencies responsible for planning, implementation, and evaluation of emergency medical services (EMS) programs; and aid in the administration of service unit licensing, where applicable. The subsystem consists of an emergency services directory file, an emergency medical services inventory file, a hospital/medical center emergency room inventory file, and an EMS operations file. The data contents of the four subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.  
HS-820 275

**SMALL CAR INVOLVEMENT IN ACCIDENTS**  
Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.  
J. O'Day, H. Golomb, P. Cooley 1973 25p 19refs  
Presented at General Motors Automotive Safety Seminar, Warren, 20-21 Jun 1973.  
Corporate author

Vehicle size, Vehicle weight, Injury prediction, Injury rates, Injuries by vehicle size, Accident rates, Single vehicle accidents, Vehicle vehicle collisions, Seat belt usage, Driver age

A statistical study was made to assess the risk of injury to small and large car occupants in collisions. A distinct change to a more uniform distribution of vehicles by weight was noted. Small cars were defined as those weighing 3100 lbs or less, and large cars 3300 lbs and greater. Effects of restraint usage, driver age, and the average number of occupants in vehicles were considered. It was found that the risk of injury increases as vehicle weight decreases, and is expressed in a mathematical formula. About one percent of accident injuries in 1972 were attributed to the change in mean vehicle weight as compared with that of 1969.

HS-013 606

**IN DEPTH STUDY OF SEAT BELTED ACCIDENTS**

Monash Univ., Clayton, Vic. (Australia)  
For primary bibliographic entry see Fld. 5N.  
HS-013 613

**ACCIDENT EXPERIENCE WITH HI DRO CUSHIONS  
IN SEATTLE--A TOPICS EVALUATION REPORT**

For primary bibliographic entry see Fld. 2D.  
HS-013 633

**1C. Investigation And Records**

**RESTRAINT SYSTEM EFFECTIVENESS-A STUDY OF  
FATAL ACCIDENTS**

General Motors Corp., Warren Mich. Environmental Activities Staff  
For primary bibliographic entry see Fld. 5N.  
HS-013 604

**A STATISTICAL DESCRIPTION OF LARGE AND  
SMALL CAR INVOLVEMENT IN ACCIDENTS**

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.  
For primary bibliographic entry see Fld. 1B.  
HS-013 606

**THE 1000 CAR FIELD TRIAL PROGRAM**

General Motors Corp., Warren, Mich. Environmental Activities Staff  
For primary bibliographic entry see Fld. 5N.  
HS-013 612

**IN DEPTH STUDY OF SEAT BELTED ACCIDENTS**

Monash Univ., Clayton, Vic. (Australia)  
For primary bibliographic entry see Fld. 5N.  
HS-013 613

## Group 1C—Investigation And Records

**ROAD ACCIDENT INVESTIGATION. ACCIDENTS IN SWEDEN WITH SAAB 99, REPORT FROM FIRST PHASE**

Uddevalla Central Hosp. (Sweden); Saab-Scania A.B., Sodertalje (Sweden)  
For primary bibliographic entry see Fld. 1E.  
HS-013 621

**REPORTS ON TRAFFIC ACCIDENT RESEARCH, VOLVO, MARCH 1973**

66P 2REFS  
Reference copy only

Accident research, Restraint system usage, Restraint system effectiveness, Three point restraint systems, Fatality causes, Volvos, Sweden, Data acquisition, Automobile repair costs, Damage severity index, Head restraints, Injury severity, Impact angle, Ejection, Accident analysis, Urban areas, Injury prevention, Injury severity index, Rural areas, Accident severity, Deformation analysis, Accident case reports, Accident types, Experimental automobiles, Safety cars, Crashworthiness

Volvo accidents for 1972 in Sweden are analyzed with reference to three point restraint system and seat belt effectiveness and crashworthiness of the Volvo Experimental Safety Car (VESC). Fatal accidents involving Volvo models 142, 144, 145, and 164 during 1972 were also analyzed to determine fatality causes and methods of fatality prevention. It was concluded that front seat belt usage has increased since 1967; the mean injury-reducing effect of seat belts for drivers and front seat passengers was 32% and 36%, respectively; head restraints in the front seats reduced neck injuries by approximately 55%, and compliance with the VESC crashworthiness specification would have had some positive effect.  
HS-013 622

**REVIEW OF MULTIDISCIPLINARY ACCIDENT INVESTIGATION (MDAI) REPORT AUTOMATION AND UTILIZATION PROGRAM**

HIT Lab Reports v3 n6 p1-8 (Feb 1973)  
J. C. Marsh, 4th 1973  
Contract DOT-HS-013-1-037  
Summary of five volume contract report, HS-800 767--HS-800 771.  
HIT-LAB Reports v3 n6 p1-8 (Feb 1973)

Accident investigation, Multidisciplinary teams, Automated accident records, Computerized records management, Electronic accident analysis, Accident reports, Data banks, Data processing, Accident factors, Damage, Coding systems, Injury factors, Statistical analysis, Information retrieval

Clinical investigations of 3,259 case vehicles have been automated and utilized by the National Highway Traffic Safety Administration, six multidisciplinary accident investigation teams, and four Motor Vehicle Manufacturer's Association member companies. The goal of the report automation and utilization program is to provide effective and efficient information channels between the field investigator and data analyst. Reports from the field teams are submitted to their respective sponsors and then transmitted to Highway Safety Research Institute for automation. The reports are edited for consistency, completeness, and correctness before being processed into computer storage files. The automated reports are then utilized by the sponsor's analysts and by the field teams, and the data files are

utilized to retrieve specific cases of interest and to perform statistical analysis of the aggregated cases.  
HS-013 623

**HIGHWAY ACCIDENT REPORT. PROPANE TRACTOR-SEMITRAILER OVERTURN AND FIRE, U.S. ROUTE 501, LYNCHBURG, VIRGINIA, MARCH 9, 1972**

29P 12REFS Rept. No. NTSB-HAR-73-3, 55-H-21  
Contains Highway Safety Recommendations H-73-20 through H-73-29.  
Corporate author

Truck overturn accidents, Accident case reports, Tractor semitrailers, Accident caused fires, Driver error caused accidents, Tank trucks, Propane, Accident causes, Burns, Fatality causes, Injury causes, Wrong way driving, Truck center of gravity, Accident location, Vehicle fixed object collisions, Vehicle characteristics, Property damage accidents, Driver emergency responses, Accident prevention, Transportation of hazardous materials, Driver licensing, Driver records, Warning signs, Accident analysis, Damage severity, Road grades, Road curves, Truck stability, Traffic signs, Centerline markings, Ruptures, Vehicle design, Lynchburg, Driver characteristics, Vehicle dynamics

A tractor semitrailer (tank) carrying pressurized liquid propane overturned at 2:30 p.m. After overturning, the vehicle slid on its side and struck a rock embankment, which ruptured the tank shell and permitted the propane to escape. When the propane-air mixture ignited, two persons, including the truck driver, were killed, and five others were injured. The cause of the overturn was the driving of the tractor semitrailer on the wrong side of the road, and a subsequent evasive steering action which exceeded the limited capability of the truck to resist overturn. Contributing factors included a misleading traffic sign, an inadequate centerline marking, and the high center of gravity of the truck. The causes of the burn fatalities and injuries were rupture of the tank at a point susceptible to rupture and the inadequacy of the required placards as a means of warning bystanders of the nature and range of the hazard.  
HS-013 627

**CAUSES OF TRAFFIC ACCIDENTS**

Traffic Engineering v43 n9 p41-4, 60, 70 (June 1973)  
P. H. Wright, E. J. Baker 1973 6refs  
Traffic engineering v43 n9 p41-4, 60, 70 (Jun 1973)

Accident causes, Accident investigation, Accident reports, Accident research, Multidisciplinary teams, Accident analysis, Human factors, Environmental factors, Defects, Precrash phase, Crash phase, Postcrash phase

Progress in reaching valid scientific conclusions regarding the causes of accidents has been inhibited by the complexity of many crashes, difficulties of collecting data, biases of investigators and researchers, and lack of generally accepted definitive procedures and terminology for analyzing and reporting accident causation factors. Police reports provide limited information about the factor or combination of factors which explain the occurrence of an accident. Police officers tend to equate traffic violation with accident causation. The use of multidisciplinary accident investigation teams can help to avoid disciplinary bias in accident research.  
HS-013 634

**A STUDY OF PAVEMENT SKID RESISTANCE AT HIGH SPEEDS AND AT LOCATIONS SHOWN TO BE FOCAL POINTS OF ACCIDENTS. FINAL REPORT**

Tennessee Univ., Knoxville  
For primary bibliographic entry see Fld. 2D.  
HS-013 637

**INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (2ND) PROCEEDINGS, SAN FRANCISCO, JULY 16-18, 1973. VOL. 1, PT. 1, MOTORCYCLE SAFETY**

**308P 90REFS**

Includes HS-013 639--HS-013 653.  
Corporate author

Motorcycle safety, Motorcycle operators, Motorcycle accidents, Motorcycle handling, Helmets, Accident prevention, Age factor in accidents, Accident causes, Motorcycle operator education, Accident analysis, Accident statistics, Motorcycle riding techniques, Motorcycle operator fatalities, Motorcycle operator injuries, Motorcycle passenger fatalities, Motorcycle passenger injuries, Defensive driving, High school driving courses, Impact tests, Helmet design, Motorcycle design, Motorcycle restraint systems, Vehicle stability, Computerized simulation, Vehicle dynamics, Injury prevention

Because of the increasing popularity of motorcycles both for basic transportation and recreational activities, a conference of industry and government leaders was held to discuss aspects of motorcycle safety including motorcycle accident statistics, causes, characteristics, and age factor in accidents; motorcycle operation education; helmet design and the effectiveness of helmets and other protective clothing in accidents; and motorcycle stability and handling.

HS-013 638

**CONTRIBUTORY FACTORS IN MOTORCYCLE CASUALTY ACCIDENTS**

Iowa Univ., Iowa City  
J. J. O'Mara 1973 22p 14refs Rept. No. Paper-73003  
HS-013 638, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 1, Motorcycle Safety, Washington, D. C. 1973

Motorcycle accidents, Motorcycle operator fatalities, Motorcycle passenger fatalities, Motorcycle registration, Epidemiology, Accident prevention, Fatality prevention, Highway design, Motorcycle design, Motorcycle laws, Law enforcement, Motorcycle operator education, Motorcycle safety, Safety campaigns, Safety engineering, Accident causes

The annual toll of motorcycle accidents in the United States stabilized in 1967 at approximately 2,000 riders killed per year after an increase of over 140% in the previous three-year period. The increase in fatalities paralleled an increase in registered motorcycles from 786,000 in 1963 to 1,750,000 in 1966. A stochastic comparison of three-year periods before and after the abrupt change in 1967 indicates that the deaths of approximately 5,100 persons were prevented in the latter period, 1967, 1968, and 1969. However, the situation became unstable again in 1970 when motorcycle rider deaths increased to approximately 2,330. The National Safety Council estimate for 1971 is 2,410 riders killed, and there are indications that this increasing trend continued through 1972 and may not be arrested yet. Safety design and engineering of motorcycles and highways, motorcycle law enforcement, and public safety education are needed to help prevent motorcycle accidents.

HS-013 640

**A PRELIMINARY ANALYSIS OF SAFETY HELMET EFFECTIVENESS**

National Hwy. Traf. Safety Administration, Washington, D.C.  
For primary bibliographic entry see Fld. 3C.  
HS-013 646

**THE ROLE OF HELMETS IN MOTORCYCLE ACCIDENTS**

Tokyo Jikeikai Univ. (Japan)  
For primary bibliographic entry see Fld. 3C.  
HS-013 647

**POLICE TRAFFIC SERVICES BASIC TRAINING PROGRAM. VOL. 3. STUDENT STUDY GUIDE**

Dunlap and Associates, Inc., Darien, Conn.  
For primary bibliographic entry see Fld. 2H.  
HS-800 720

**MULTIDISCIPLINARY ACCIDENT INVESTIGATIONS, PHASE 1. FINAL REPORT**

University of Southern California, Los Angeles  
W. H. Wood, J. D. Baird 1973 446p 14refs Rept. No. USC-MR-5  
Contract DOT-HS-010-1-176  
Report for June 1971-Jul 1972.  
NTIS

Accident investigation, Multidisciplinary teams, Accident case reports, Los Angeles, Accident causes, Accident analysis, Day of week, Time of day, Injury severity, Month, Driver characteristics, Driver behavior, Precrash phase, Restraint system usage, Accidents by vehicle age, Seat occupation, Accident location, Environmental factors, Driver performance, Accidents by vehicle condition, Accidents by body types, Damage severity, Defects, Vehicle safety standards, Highway safety standards, Crash phase, Highway safety programs, Accident prevention, Drinking drivers, Accident types, Driver error caused accidents, Police traffic services, Accident statistics, Accident diagrams, Driver physical fitness, Vehicle usage, Accident factors, Postcrash phase

The findings of 40 motor vehicle collision studies that occurred in Los Angeles from July 1971 to May 1972 are summarized. The research was performed by a multidisciplinary group of medical, engineering, and accident prevention specialists supported by consultants from legal, enforcement, and forensic pathology disciplines. The results of the collisions are discussed with emphasis on the vehicular, environmental, and human factors involved. The effectiveness of new Federal safety features and safety program standards are addressed. Conclusions and recommendations based upon data and problems revealed by the individual case studies are also expressed. Summaries of the 40 case studies are included.

HS-800 876

**HUMAN FACTORS COUNTERMEASURES TO IMPROVE HIGHWAY-RAILWAY INTERSECTION SAFETY. FINAL REPORT**

Biotechnology, Inc., Falls Church, Va.  
For primary bibliographic entry see Fld. 3D.  
HS-800 888

## Group 1C—Investigation And Records

**MULTIDISCIPLINARY ACCIDENT INVESTIGATIONS--PHASE 2. FINAL REPORT**

University of Southern Calif., Los Angeles  
 J. D. Baird, F. L. Sublett, G. A. Parkison, E. Austin, J. M. Pang, S. L. Kirkpatrick, N. E. DeBiasi, R. P. Hill, M. L. Ike  
 1973 421p 2refs Rept. No. USC-73-Phase-2-Final  
 Contract DOT-HS-010-1-176  
 Report for Jul 1972-Jul 1973.  
 NTIS

Accident investigation, Multidisciplinary teams, Accident case reports, Los Angeles, Accident causes, Accident analysis, Driver characteristics, Seat occupation, Injury severity, Restraint system effectiveness, Accident types, Damage severity, Month, Time of day, Environmental factors, Vehicle safety standards, Highway safety standards, Driver behavior, Driver performance, Injury causes, Postcrash phase, Accident prevention, Accident reconstruction, Accident report forms, Accident location, Accident factors, Accident diagrams, Mathematical analysis, Air bag restraint systems, Day of week, Precrash phase, Crash phase

The findings of multidisciplinary investigations of 80 accidents that occurred in Southern California, primarily in the city of Los Angeles, from July 1971 to July 1973 are presented. The research was a team effort of mechanical engineers, physicians, a psychologist, an automotive engineer, a pathologist, a mathematician, technicians, an analyst, secretaries, and graduate and undergraduate students. The research includes a study of procedures utilized in investigating and reporting the vehicular, environmental, and human factors involved during the precrash, crash, and postcrash phases of the collision. Summaries of the 80 cases studied are included.  
 HS-800 920

**HUMAN FACTOR VARIABLES AND FATAL VEHICULAR ACCIDENTS: A PILOT STUDY. FINAL REPORT**

Boston Univ., Mass.  
 R. S. Sterling-Smith 1972 49p 15 refs Rept. No. FR-1  
 Contract FH-11-7402  
 Report for 1 Oct 1971-30 Sep 1973.  
 NTIS

Accident investigation, Multidisciplinary teams, Human factors, Fatalities, Accident case reports, Boston, Accident analysis, Accident causes, Research methods, Driver characteristics, Psychological factors, Driver personality, Medical factors, Alcohol usage, Sociological factors, Drug usage, Driver records, Driver intoxication, Accident factors

The Boston Pilot Study included the systematic investigation of 50 fatally involved motor vehicle accidents collected over an eight month period in the greater Boston area. In each accident the operator of the vehicle initially judged to have been principally responsible for the collision was the focal point of investigation. The results showed that 16 operators killed themselves in accidents; 19 operators killed another occupant in accidents; and 15 operators struck and killed a pedestrian. Data concerning the responsible driver's family of origin and current domestic environment; demographic data; psychological and sociological factors; subject's physical health history; prior and focal alcohol and drug use; legal, arrest, and probationary histories; and factors companion to the focal accident were collected and analyzed. A description of the research design and methodology, case studies, and results of the analysis are presented.

HS-800 921

**DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 4, ACCIDENT DATA SUBSYSTEM**

199P  
 GPO

Information system design, Computerized records management, Coding systems, Data processing, Automated accident records, Traffic records, Manuals, State planning

The Accident Data Subsystem of the State Traffic Records System has the primary functional objective of serving the operational requirements related to the collection and maintenance of data on traffic accidents occurring within the State. The subsystem also serves as the central focus of the integrated traffic records system data base, providing a main thread in the interlinking of files within the system and traffic safety analyses conducted from the data within these files. To accomplish this, the subsystem data contents provide linkage data elements for access to the other subsystems. The subsystems consists of an accident case directory file, a basic case data file, a fatalities analysis supplement file, and an in-depth investigation supplement file. The data contents of the four subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.  
 HS-820 274

**2. HIGHWAY SAFETY****PROJECT TRACES. TRAFFIC ACCIDENT AND CITATION EVALUATION SYSTEM. FINAL PROJECT REPORT**

187P Rept. No. APD-TECH-72-110-1

Sponsored by California Office of Traf. Safety and the National Hwy. Traf. Safety Administration. Subcontracted to Applied Technology.  
 Redondo Beach Police Dept., Calif.

Traffic records, Computerized records management, Program evaluation, Police traffic services, Traffic law enforcement, Accident prevention, Traffic ticket systems, Traffic law violations, Redondo Beach, Police training, Planning, Accident report forms, Systems analysis, Flow charts, Federal aid, Budgets, Property damage accidents, Personnel, Accounting, Computer printouts, Accident causes, Accident types, Traffic engineering, Accident severity, Time of day, Day of week, Intersections, Accident statistics, Injury statistics, Fatality rates, Traffic management, Accident location

A computerized traffic records system has been designed, tested, and implemented in Redondo Beach in order to supplement the present Police Information Management System; provide improved traffic planning, law enforcement, and management; provide before and after data required to measure the effects of traffic planning changes; detect high or potentially high accident locations and accident causes; and design accident, fatality, and injury countermeasures. A detailed project plan; data on agency and project background; project problems, documentation, and personnel; a training plan; progress reports; an intersection index; and system input and coding forms are included. At the present time all program objectives except

January 16, 1974

**HIGHWAY SAFETY—Field 2**  
**Design And Construction —Group 2D**

for the design of collision, fatality, and injury countermeasures and the planning and implementation of selected enforcement and other operational programs are being met satisfactorily.  
HS-013 614

**MISSOURI TRAFFIC ACCIDENT  
CHARACTERISTICS**

Missouri Univ., Rolla. Transp. Inst.  
G. E. Carlson 1972 143p  
Contract APA-72-01-001  
Corporate author

Accident statistics, Injury statistics, Fatality rates, Missouri, Forecasting, Accident analysis, Injuries by accident type, Accident causes, Road conditions, Driver residence, Driver age, Age factor in accidents, Accident types, Time of day, Boat trailers, Travel trailers, Towing, School buses, Farm vehicles, Bus accidents, Truck accidents, Motorcycle accidents, Pedestrian accidents, Campers (truck mounted), Drinking drivers, Driver intoxication, Tractor semitrailers, High speed caused accidents, Vehicle fixed object collisions, Urban areas, Injury rates

Missouri traffic accidents are analyzed by type, cause, road conditions, driver age, driver residence, time of day, city size, and vehicle type. Injury and fatality rates by accident type are presented. Full accident report information was available only since May 1971 for accidents investigated by the Missouri Highway Patrol. Accident data for 1967-1971 was obtained from the Missouri Highway Patrol on National Safety Council Standard Summary forms. Traffic accident summary data was also requested from a sample of all cities in Missouri with populations over 5000 which have a police department and 40 cities with police departments and populations under 5000.  
HS-013 618

**ROAD ACCIDENT INVESTIGATION. ACCIDENTS IN  
SWEDEN WITH SAAB 99, REPORT FROM FIRST  
PHASE**

Uddevalla Central Hosp. (Sweden); Saab-Scania A.B., Sodertalje (Sweden)  
C. G. Backstrom, C. E. Andersson, E. Forsman, L. E. Nilsson  
1972 44p  
Reference copy only

Accident investigation, Sweden, Accident studies, Property damage accidents, Accident rates, Injury rates, Accidents by vehicle age, Injury severity, Accident types, Injury causes, Seat belt usage, Seat belt effectiveness, Injuries by seat occupation, Accident severity, Injuries by body area, Rural accidents, Urban accidents, Injuries by accident type, Impact angle, Deformation, Accident factors, Injury severity index, Damage severity, Saab 99

In the beginning of 1971 Saab-Scania decided to start a Road Accident Investigation as a further aid to develop safer cars. An evaluation of accident data collected from May 1, 1971 to April 30, 1972 and from September 1, 1972 to November 30, 1972 is presented. The total number of accidents covered was 1,523 of which 158 were in depth investigations. Only accidents involving the Saab 99 model automobile were investigated. Information on accident rates, accident types, injury rates, injury severity, injury causes, vehicle damage, seat belt usage, and accident location is presented in graphs and tables.  
HS-013 621

**COMPARISON OF AGE FREQUENCY OF FATAL  
AND NON-FATAL MOTORCYCLE ACCIDENT  
VICTIMS FROM SEVERAL INTERNATIONAL  
GEOGRAPHICAL AREAS**

Miami Univ., Coral Gables, Fla.; Birmingham Univ. (England)  
For primary bibliographic entry see Fld. 3C.  
HS-013 639

**CHARACTERISTICS OF MOTORCYCLE ACCIDENTS  
IN JAPAN**

Honda R and D Co. Ltd., Tokyo (Japan)  
H. Inayoshi 1973 21p Rept. No. Paper-73004  
HS-013 638, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 1, Motorcycle Safety, Washington, D. C., 1973

Motorcycle accidents, Accident statistics, Accident analysis, Japan, Accident factors, Fatality rates, Motorcycle operator fatalities, Injury statistics, Motorcycle safety, Vehicle vehicle accidents, Pedestrian accidents, Accident causes, Motorcycle operator education, Motorcycle operator experience, Motorcycle power, Single vehicle accidents, Accident rates

In Japan the decrease in the number of traffic accident fatalities in 1972 was 442 or 2.7% and motorcycle rider deaths decreased by 354, accounting for 80% of the total decrease. Motorcycle accident statistics are compared with accident statistics for other vehicles and causes of single vehicle and vehicle vehicle motorcycle accidents are identified. The relationship between motorcycle operator experience and motorcycle accidents is discussed and suggestions to improve motorcycle safety are made.

HS-013 641

**PROMOTION OF SAFETY RIDING EDUCATION  
ACTIVITIES FOR MOTORCYCLISTS**

Japan Traf. Safety Assoc.  
For primary bibliographic entry see Fld. 3C.  
HS-013 642

**2. HIGHWAY SAFETY**

**2D. Design And Construction**

**ACCIDENT EXPERIENCE WITH HI DRO CUSHIONS  
IN SEATTLE--A TOPICS EVALUATION REPORT**

Traffic Engineering v43 n9 p34-9 (Jun 1973)  
G. E. Kruger 1973 8refs  
Traffic Engineering v43 n9 p34-9 (Jun 1973)

Water cushions, Impact attenuation, Injury prevention, Accident costs, Benefit cost analysis, Injury severity, Vehicle fixed object collisions, Accident survivability, Energy absorption, Human deceleration tolerances, Injury severity index, Seattle, Highway improvements, Safety device effectiveness, Safety device costs, Hi Dro Cushion

From 1968 to the present time, 10 Hi Dro Cushion units have been installed on viaducts and expressways in Seattle. Two Hi Dro Cushion units--the cell cluster and the cell sandwich--are described. A study conducted to determine the effectiveness of these units in preventing or reducing injuries and reducing accident costs indicates that more than 85% of gore accident costs have been eliminated, and no one has suffered more than a 3 inch laceration or a temporary loss of consciousness in the 26



accidents after Hi Dro Cushions were installed. Of further significance is that none of the people in the reported accidents were wearing seat belts. The benefit/costs for the units have been calculated to be greater than 17 to one for the cell sandwich units and 40 to one for the cell cluster design. Seattle intends to continue installation at about four a year.  
HS-013 633

#### **FACTORS AFFECTING VEHICLE SKIDS: A BASIS FOR WET WEATHER SPEED ZONING. INTERIM REPORT**

Texas A and M Univ., College Station. Texas Transp. Inst. G. D. Weaver, K. D. Hankins, D. L. Ivey 1973 75p 15refs Rept. No. RR-135-2F, PB-220 367  
Sponsored by Texas Hwy. Dept. in cooperation with the Federal Hwy. Administration.  
NTIS

Pavement skid resistance, Wet road conditions, Speed zones, Pavement friction, Water effects, Speed limits, Coefficient of friction, Tire pavement interface, Cornering, Passing, Hydroplaning, Water depth, Tire tread depths, Stopping distance, Road curves, Highway engineering, Accident avoidance, Steering, Braking, Tire inflation pressure, Nomographs, Mathematical analysis, Texas

Since speed is a vital contributing factor in wet weather skidding accidents, establishment of wet weather speed limits could help to relieve the immediate problem in priority locations. Findings from skid research have been assimilated to form a basis for equating pavement skid resistance at a site to the expected friction demand for selected maneuvers. Friction normally decreases with increased speed. Since the speeds in question are usually in excess of 40 mph, the speed at which skid numbers are normally determined, the change in available friction with respect to speed must be considered using nomographs and curves. Curves are presented to determine the critical speed for hydroplaning, stopping maneuvers, cornering maneuvers, passing maneuvers, emergency path-correction maneuvers, and combined maneuvers. A process of implementing wet weather speed zoning at selected sites and a design process to establish the wet weather speed limit are outlined.  
HS-013 635

#### **VARIABLES ASSOCIATED WITH AUTOMOBILE TIRE HYDROPLANING**

Texas A and M Univ., College Station. Texas Transp. Inst. For primary bibliographic entry see Fld. 5V.  
HS-013 636

#### **A STUDY OF PAVEMENT SKID RESISTANCE AT HIGH SPEEDS AND AT LOCATIONS SHOWN TO BE FOCAL POINTS OF ACCIDENTS. FINAL REPORT**

Tennessee Univ., Knoxville  
A. B. Moore, J. B. Humphreys 1972 137p 4refs Rept. No. RP-7-FR, PB-220 321  
Contract 440.929, HPR-1(7)  
NTIS

Pavement skid resistance, High speed, Pavement surface texture, Accident rates, Skid resistance tests, Pavements, Pavement tests, Field tests, Laboratory tests, Coefficient of friction, Accident location, Wet road conditions, Test equipment, Tennessee

Over 70 locations were selected as being representative of pavement surface mixes used in Tennessee. Textures ranged from very fine sand asphalt to very coarse, highly skid resistant slag aggregate. Cores from each location were evaluated to determine surface texture parameters. There was a high degree of correlation between surface texture skid resistance and field measurements of skid resistance. Over 450 accidents were used to analyze skid resistance-accident correlation. Correlations were established for wet pavement accident percentages with friction coefficients measured at 40 mph and higher speeds. The lower friction values resulted in a higher percentage of wet pavement accidents, with a break point slightly above an 0.04 coefficient of friction. Analyses were made as to whether pavements ranked according to their slipperiness at 40 mph would be similarly ranked if skid tests were made at higher speeds. Results indicated that the rankings had high agreement.  
HS-013 637

#### **DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 3, ROADWAY ENVIRONMENT DATA SUBSYSTEM 121P GPO**

Information system design, Computerized records management, Data processing, Coding systems, Highway location, Highway characteristics, Manuals, State planning, Traffic records, Intersections, Bridges

The Roadway Environment Data Subsystem of the State Traffic Records System is designed to provide an inventory of the State primary and secondary roadway facilities; support the operational functions of roadway planning, management of traffic operations, and roadway maintenance; and provide the information necessary for the identification of safety problems and determination of remedial actions. The subsystem consists of a roadway location directory file, a basic roadway characteristics file, an intersection characteristics file, a bridge structure inventory file, and a roadway location history file. The data contents of the five subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.  
HS-820 273

#### **2G. Meteorological Conditions**

##### **COST EFFECTIVENESS OF EMISSION CONTROL**

Journal of the Air Pollution Control Association v23 n3 p173-9 (Mar 1973)  
L. R. Babcock, Jr., N. L. Nagda 1973 21 refs  
Journal of the Air Pollution Control Association v23 n3 p173-9 (Mar 1973)

Emission control, Benefit cost analysis, Air pollution costs, Air pollution control costs, Exhaust emissions, Air pollution sources, Federal control, Emission standards, Air pollution emission tables

Steam electric power plants, gasoline motor vehicles, and industrial boilers have been identified as the major sources of air pollution (50% of the nationwide total). Successful implementation of Environmental Protection Agency policies would reduce nationwide pollution damages by 1976 to roughly 56% of 1967 levels, with cost/benefit ratio of only 0.39. The projections

beyond 1976 are less satisfying since continuing controls for new automobiles, costing almost —4 billion per year, would only reduce overall pollution levels an additional 10% at an uneconomic cost/benefit ratio of 1.6. Rather than stringent nationwide controls, more limited controls coupled with traffic management may be more desirable methods for reducing pollution levels in congested urban areas.  
HS-013 629

### **A PRELIMINARY STUDY OF MODELING THE AIR POLLUTION EFFECTS FROM TRAFFIC ENGINEERING ALTERNATIVES**

Journal of the Air Pollution Control Association v 23 n6 p449-504 (Jun 1973)

F. L. Ludwig, R. C. Sandys, A. E. Moon 1973 12refs

Journal of the Air Pollution Control Association v23 n6 p449-504 (June 1973)

Exhaust densities, Carbon monoxide, Traffic engineering, Forecasting, Meteorology, Exhaust emission control, Traffic flow, Traffic signal delay time, Mathematical models, Idling, Starting

Three separate mathematical models were combined to calculate the changes in carbon monoxide (CO) concentrations that might result from traffic engineering changes. The three models used were the Dynamic Highway Transportation Model which relates traffic flow patterns to physical parameters and traffic signal characteristics of a network; an emission model that predicts CO emissions from traffic flow parameters such as number of stops and idling time; and the Air Pollution Research Advisory Committee-1A Urban Diffusion Model which calculates CO concentrations from source distributions and meteorological factors. The composite model was applied to traffic in downtown Chicago for a specific set of meteorological conditions. Results are compared for two traffic signal control schemes. In those blocks where concentrations were highest, the model indicates a 20% reduction is possible through improved traffic signal controls. The model should be useful for testing other traffic control measures.

HS-013 632

### **FACTORS AFFECTING VEHICLE SKIDS: A BASIS FOR WET WEATHER SPEED ZONING. INTERIM REPORT**

Texas A and M Univ., College Station. Texas Transp. Inst.

For primary bibliographic entry see Fld. 2D.

HS-013 635

## **2H. Police Traffic Services**

### **PROJECT TRACES. TRAFFIC ACCIDENT AND CITATION EVALUATION SYSTEM. FINAL PROJECT REPORT**

187P Rept. No. APD-TECH-72-110-1

Sponsored by California Office of Traf. Safety and the National Hwy. Traf. Safety Administration. Subcontracted to Applied Technology.

Redondo Beach Police Dept., Calif.

Traffic records, Computerized records management, Program evaluation, Police traffic services, Traffic law enforcement, Accident prevention, Traffic ticket systems, Traffic law violations, Redondo Beach, Police training, Planning, Accident re-

port forms, Systems analysis, Flow charts, Federal aid, Budgets, Property damage accidents, Personnel, Accounting, Computer printouts, Accident causes, Accident types, Traffic engineering, Accident severity, Time of day, Day of week, Intersections, Accident statistics, Injury statistics, Fatality rates, Traffic management, Accident location

A computerized traffic records system has been designed, tested, and implemented in Redondo Beach in order to supplement the present Police Information Management System; provide improved traffic planning, law enforcement, and management; provide before and after data required to measure the effects of traffic planning changes; detect high or potentially high accident locations and accident causes; and design accident, fatality, and injury countermeasures. A detailed project plan; data on agency and project background; project problems, documentation, and personnel; a training plan; progress reports; an intersection index; and system input and coding forms are included. At the present time all program objectives except for the design of collision, fatality, and injury countermeasures and the planning and implementation of selected enforcement and other operational programs are being met satisfactorily.

HS-013 614

### **POLICE TRAFFIC SERVICES BASIC TRAINING PROGRAM. VOL. 3. STUDENT STUDY GUIDE**

Dunlap and Associates, Inc., Darien, Conn.

A. Hale, J. W. Hamilton 1972 233p 69refs

Contract DOT-HS-099-1-137

Vol. 1 is HS-800 718; vol. 2 is HS-800 719.

GPO \$2.25

Police training, Police traffic services, Curricula, Traffic control, Traffic law enforcement, Emergency services, Accident investigation, Traffic courts, Traffic laws, Traffic signs, Traffic signals, Pavement markings, Speed estimation from skidmarks, Alcohol chemical tests, Alcohol breath tests, Traffic surveillance, Traffic law violators, Drinking drivers, Alcohol effects, Drug effects, Driver physical fitness, Driver mental fitness, Police motorist contacts, Accident causes, Accident reports, Accident diagrams, Photography, Evidence, Accident caused fires, Hazardous materials

This study guide has been prepared to serve as the basic course textbook. It contains a summarization of information presented in the lesson plans on traffic law and traffic law enforcement, traffic direction and control, accident management, and preparation for traffic court. Graphic exhibits which are referenced in the lesson plans are included.

HS-800 720

### **POLICE TRAFFIC SERVICES SUPERVISORY LEVEL TRAINING PROGRAM. STUDENT STUDY GUIDE**

Dunlap and Associates, Inc., Darien, Conn.

E. W. Bishop, A. Hale, J. W. Hamilton, J. T. Fucigna 1973 69p 35refs

Contract DOT-HS-099-1-137

Prepared for National Hwy. Traf. Safety Administration.

GPO \$1.25

Police traffic services, Police training, Police supervision

The Student Study Guide provides an outline and overview of the supervisory course along with an outline of each lesson that indicates the major topics and objectives. In addition, the guide identifies specific reading and reference sources for each les-

**Field 2—HIGHWAY SAFETY****Group 2H—Police Traffic Services**

son. This guide also provides guidance about how to prepare for each lesson and contains study hints as well as information about student evaluation.

HS-800 827

**POLICE TRAFFIC SERVICES SUPERVISORY LEVEL TRAINING PROGRAM. INSTRUCTOR'S LESSON PLANS**

Dunlap and Associates, Inc., Darien, Conn.

E. W. Bishop, A. Hale, J. T. Fucigna 1973 184p 35refs

Prepared for U. S. Dept. of Transp., National Hwy. Traf. Safety Administration.

GPO \$2.85

Police traffic services, Police training, Police supervision, Curricula, Instruction materials

This document provides guidance to the instructor in the preparation and delivery of the Police Traffic Services Supervisory Level training course. This course is intended to provide the first-line supervisor with supervisory skills directly related to the management of patrolmen assigned to traffic services. The lesson plans consist of a statement of the objectives of each lesson, a list of basic reference material for each lesson, and an outline of the content of each lesson. The plans provide a structure for the instructor and indicate the sequence of presentation as well as relative emphasis.

HS-800 828

**POLICE TRAFFIC SERVICES SUPERVISORY LEVEL TRAINING PROGRAM. COURSE GUIDE**

Dunlap and Associates, Inc., Darien, Conn.

E. W. Bishop, A. T. Hale, J. T. Fucigna 1973 27p 35refs

Contract DOT-HS-099-1-137

Prepared for National Hwy. Traf. Safety Administration.

GPO \$0.70

Police traffic services, Police training, Police supervision, Manuals, Instruction materials

The Course Guide has been prepared as an aid for the training administrator in his planning and conduct of the Police Traffic Services Supervisory Course. It contains a description of the course content; suggestions for course planning, including the scheduling of lessons, class size, prerequisites for students and instructors, training facilities and resources, and instructor and student material; guidelines for conducting the course; and recommendations for measuring student achievement.

HS-800 829

**EMERGENCY MEDICAL SERVICES: CRASH INJURY MANAGEMENT FOR TRAFFIC LAW ENFORCEMENT OFFICERS. FINAL REPORT**

Dunlap and Associates, Inc., Darien, Conn.

For primary bibliographic entry see Fld. 1A.

HS-800 897

**2I. Traffic Control**

**EVALUATION OF REFLECTORIZED TRAFFIC SIGN MATERIALS UNDER CONTROLLED RAINFALL CONDITIONS**

Illinois Univ., Urbana. Hwy. Traf. Safety Center

E. D. Brenning 1973 80p 17refs Rept. No. RR-7

Corporate author

Traffic signs, Reflectorized signs, Sign effectiveness, Sign materials, Rain, Sign visibility, Materials tests, Sign reflectance, Reflective materials, Reflectorized pavement markings, Laboratory tests, Test equipment, Test facilities, Variance analysis, Sign tests, Chi square test, Illinois, Sign colors, Data acquisition, Sign regulations, Weather

The effectiveness of reflectorized signs in rain was studied. Various reflective materials used on traffic signs were evaluated by measuring the brightness of the material when illuminated by an appropriate light source. The technique and equipment developed to test the materials under controlled rainfall conditions in the laboratory are described and detailed results of the tests are presented. In general, it was concluded that the procedure used in the Federal Specification for rainfall testing of products should be more clearly defined; reflective intensity of traffic signs will not always be lowered when subjected to rainfall conditions; and weathering does affect the reflective intensity value of reflectorized materials. There is insufficient evidence for concluding that there is a significant difference between the amount of reflectivity of the materials tested at the different rainfall intensity levels--1.06 to 3.84 IPH. Areas for future research are recommended.

HS-013 624

**A PRELIMINARY STUDY OF MODELING THE AIR POLLUTION EFFECTS FROM TRAFFIC ENGINEERING ALTERNATIVES**

For primary bibliographic entry see Fld. 2G.

HS-013 632

**POLICE TRAFFIC SERVICES BASIC TRAINING PROGRAM. VOL. 3. STUDENT STUDY GUIDE**

Dunlap and Associates, Inc., Darien, Conn.

For primary bibliographic entry see Fld. 2H.

HS-800 720

**2J. Traffic Courts**

**ASAP TRAFFIC COURT JUDGE TRAINING. FINAL REPORT**

47P Rept. No. DOT-HS-034-2-409-73-1

Contract DOT-HS-034-2-409; Ref: NHTSA-034-1207

Report for 16 May 1972-30 Apr 1973.

NTIS

Alcohol education, Alcohol Safety Action Projects, Traffic courts, Program evaluation, Motion pictures, Planning, Scheduling, Traffic court judges

Activities undertaken to conduct the Judicial Seminar in Alcohol Safety are summarized. The activities included review and redesign of the instruction materials, instructor training, conducting the seminars, and evaluation of the educational methodology. The administrative problems encountered by this and similar nationwide educational projects are analyzed. An evaluation of the practical, short-term success of the seminars is followed by an estimate of their long-term effect on the Alcohol Safety Action Project sites. The reasons why this educational approach is a viable system for education of local personnel by use of federal funds are discussed.

HS-800 903

## 2K. Traffic Records

### PROJECT TRACES. TRAFFIC ACCIDENT AND CITATION EVALUATION SYSTEM. FINAL PROJECT REPORT

187P Rept. No. APD-TECH-72-110-1

Sponsored by California Office of Traf. Safety and the National Hwy. Traf. Safety Administration. Subcontracted to Applied Technology.

Redondo Beach Police Dept., Calif.

Traffic records, Computerized records management, Program evaluation, Police traffic services, Traffic law enforcement, Accident prevention, Traffic ticket systems, Traffic law violations, Redondo Beach, Police training, Planning, Accident report forms, Systems analysis, Flow charts, Federal aid, Budgets, Property damage accidents, Personnel, Accounting, Computer printouts, Accident causes, Accident types, Traffic engineering, Accident severity, Time of day, Day of week, Intersections, Accident statistics, Injury statistics, Fatality rates, Traffic management, Accident location

A computerized traffic records system has been designed, tested, and implemented in Redondo Beach in order to supplement the present Police Information Management System; provide improved traffic planning, law enforcement, and management; provide before and after data required to measure the effects of traffic planning changes; detect high or potentially high accident locations and accident causes; and design accident, fatality, and injury countermeasures. A detailed project plan; data on agency and project background; project problems, documentation, and personnel; a training plan; progress reports; an intersection index; and system input and coding forms are included. At the present time all program objectives except for the design of collision, fatality, and injury countermeasures and the planning and implementation of selected enforcement and other operational programs are being met satisfactorily.

HS-013 614

### SAN MATEO COUNTY COMPUTERIZED ACCIDENT RECORDS SYSTEM (CARES). FINAL REPORT

Stanford Res. Inst., Menlo Park, Calif.

J. L. Schlaefli, M. D. Bagley 1972 20p

Prepared for County of San Mateo Engineering and Road Dept. San Mateo County Engineering and Road Dept., Redwood City, Calif.

Automated accident records, Computerized records management, Data banks, Data acquisition, Traffic records, Data reduction, Electronic accident analysis, Traffic data analysis, Information system design, California

Development of the San Mateo County Computerized Accident Records System (CARES) consisted of five major tasks: developing a comprehensive definition of CARES through review of the work already accomplished by the County; determining the basic system requirements and how best to apply computer software already developed and available to fulfill CARES needs; designing and developing CARES through modifying existing computer software and pointing out its usefulness through a pilot city demonstration; developing an appropriate data base for CARES by obtaining the necessary data and transforming them into appropriate digital form; and implementing CARES with its full data base, and training its users. Highlights of these tasks are presented and the organization and

management and some applications of CARES are briefly described.

HS-013 616

### SAN MATEO COUNTY COMPUTERIZED ACCIDENT RECORDS SYSTEM (CARES) USERS MANUAL. TECHNICAL NOTE

Stanford Res. Inst.

J. L. Schlaefli, M. D. Bagley, D. W. Cook, V. M. Gallagher, S. H. Hutchins, S. E. Rowe 1972 252p Rept. No. SRI-TN-1077-1 Prepared for County of San Mateo Engineering and Road Dept. Corporate author

Information systems, Computerized records management, Automated accident records, Traffic records, Electronic accident analysis, Traffic data analysis, Data banks, Accident reports, California, Information system design, Accident location, Safety program evaluation, Traffic law enforcement, Flow charts, Accident statistics, Traffic counts, Accident types, Traffic volume, Information retrieval, Intersections, Manuals

The San Mateo County Computerized Accident Records System (CARES) has been designed to serve the traffic safety record needs for local agency enforcement and engineering personnel. The integrated computerized system brings together data on accidents, traffic volume, and the street network. All of the CARES reports are produced using data contained in one or more of the six computer files: accident history file, intersection file, street network file, traffic volume file, stratification file, and improvement projects file. These files and the reports produced by CARES are described. Most of the 24 different CARES reports were designed for five basic applications: determination of magnitude and nature of the traffic accident problem, identification and surveillance of high accident intersections; identification and surveillance of high accident street segments; evaluation of safety improvement projects; and allocation and assignment of police traffic enforcement personnel. Detailed directions for the preparation of report requests are also included.

HS-013 617

### MISSISSIPPI HIGHWAY SAFETY INFORMATION SYSTEM

64P Rept. No. SSDC-TR-72-371

Sponsored by Mississippi Central Data Processing Authority. Reference copy only

Computerized records management, Automated accident records, Computerized driver records, Information systems, Mississippi, Flow charts, Driver identification, Data acquisition, Data processing, Vehicle registration, Licensing, Highway accident potential, Accident location, Communication systems, Planning, Emergency medical services, Traffic records, Automated law enforcement systems, Benefit cost analysis

Mississippi is developing a Highway Safety Information System (MHSIS) which will provide the information needed to assess existing highway safety programs and conditions, build new programs, and evaluate the results of the new program; support the highway safety related regulatory and operational requirements of each highway safety agency; operate within existing legislation; build upon the existing computer subsystems and be in accord with the CDPA Computer Master Plan and the Criminal Justice Information System Plan; and provide cost-effective information services. To meet these requirements the

**Group 2K—Traffic Records**

HSIS will include driver, vehicle, accident, highway/roadway, and communications information subsystems. In the future the MHSIS will also encompass emergency medical services, a local traffic records system, and a selective enforcement program.

HS-013 619

**DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 1, SYSTEM DESIGN AND DEVELOPMENT**

234P 99REFS

GPO

Information system design, Traffic records, Computerized records management, Data banks, Automated accident records, Data acquisition, Data processing, Data analysis, Data transmission, Telecommunication, Computerized driver records, Computer programs, Information retrieval, Systems engineering, Communication systems, Manuals, State planning, Manuals

The manual provides the recommended content and operational concepts for a comprehensive traffic records system incorporating a totally integrated data base which addresses the many traffic safety program areas. Details are given of descriptions of the system organization, subsystem functional design, data file organization, system data analysis and reporting concepts, telecommunications and data processing facilities, alternative techniques and equipment for data collection and conversion, data processing, data communications, data output and dissemination, techniques for definition of specific user-oriented requirements and for translation of these requirements into specific system performance and design requirements, and procedures and content requirements for preparation of procurement specifications for system hardware and software. Recommended procedures for system implementation and acceptance testing to assure the proper installation and operation of the system are also described.

HS-820 270

**DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 1, DRIVER DATA SUBSYSTEM**

62P

GPO

Information system design, Computerized records management, Computerized driver records, Coding systems, Driver licensing, Data processing, State planning, Vehicle registration, Manuals, Traffic records

The Driver Data Subsystem of the State Traffic Records System is designed to support the State's activities associated with driver licensing; provide a comprehensive correlation of licensed drivers and vehicles registered in their names; support and facilitate the State's driver control programs; and support the administration of the State's financial responsibility laws and collection of fees associated with driver licensing. The subsystem consists of a driver/owner directory file, a driver history file, and a financial responsibility file. The data contents of the three subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 271

**DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 2, VEHICLE DATA SUBSYSTEM**

81P

GPO

Information system design, Computerized records management, Coding systems, Data processing, Automatic vehicle identification, Vehicle registration, Traffic records, State planning, Manuals

The Vehicle Data Subsystem of the State Traffic Records System is designed to support State functions related to the registration of motor vehicles; provide for collection and maintenance of data related to the mechanical condition of vehicles registered in the State; provide for collection and maintenance of history records related to the theft and abandonment of motor vehicles; and support State administrative functions related to titling and lien laws for vehicular property. The subsystem consists of a vehicle identification directory file, a registration data file, a vehicle history file, a stolen, abandoned, and lost property data file, and a titling and financial data file. The data contents of the subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 272

**DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 3, ROADWAY ENVIRONMENT DATA SUBSYSTEM**

121P

GPO

Information system design, Computerized records management, Data processing, Coding systems, Highway location, Highway characteristics, Manuals, State planning, Traffic records, Intersections, Bridges

The Roadway Environment Data Subsystem of the State Traffic Records System is designed to provide an inventory of the State primary and secondary roadway facilities; support the operational functions of roadway planning, management of traffic operations, and roadway maintenance; and provide the information necessary for the identification of safety problems and determination of remedial actions. The subsystem consists of a roadway location directory file, a basic roadway characteristics file, an intersection characteristics file, a bridge structure inventory file, and a roadway location history file. The data contents of the five subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 273

**DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 4, ACCIDENT DATA SUBSYSTEM**

199P

GPO

Information system design, Computerized records management, Coding systems, Data processing, Automated accident records, Traffic records, Manuals, State planning

The Accident Data Subsystem of the State Traffic Records System has the primary functional objective of serving the operational requirements related to the collection and maintenance of data on traffic accidents occurring within the State. The subsystem also serves as the central focus of the integrated traffic records system data base, providing a main thread in the interlinking of files within the system and traffic safety analyses conducted from the data within these files. To accomplish this, the subsystem data contents provide linkage data elements for access to the other subsystems. The subsystems consists of an accident case directory file, a basic case data file, a fatalities analysis supplement file, and an in-depth investigation supplement file. The data contents of the four subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 274

#### **DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 5, EMERGENCY SERVICES DATA SUBSYSTEM**

65P

GPO

Information system design, Computerized records management, Coding systems, Data processing, Emergency medical services, Manuals, Emergency services, State planning, Traffic records

The Emergency Services Data Subsystem of the State Traffic Records System is designed to maintain an inventory of available organizations providing emergency services in response to traffic accidents and other emergency events on a State-wide basis; permit effective monitoring of the operations of the emergency services organizations in response to emergency situations; provide support to State agencies responsible for planning, implementation, and evaluation of emergency medical services (EMS) programs; and aid in the administration of service unit licensing, where applicable. The subsystem consists of an emergency services directory file, an emergency medical services inventory file, a hospital/medical center emergency room inventory file, and an EMS operations file. The data contents of the four subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 275

### **3. HUMAN FACTORS**

#### **3A. Alcohol**

##### **DRUNK DRIVER COUNTERMEASURES**

General Motors Engineering Staff, Warren, Mich.

J. A. Tennant 1973 38p 27refs

Presented at General Motors Automotive Safety Seminar, Warren, 20-21 Jun 1973.

Corporate author

Alcohol detection and interlock systems, Drinking drivers, Driver evaluation devices, Driver performance, Driver intoxication, Blood alcohol levels, Phystester, Tracking, Driver physiological test devices

Technological approaches for the identification of the impaired driver and ignition interlock systems are discussed. The objectives and desired characteristics of predriving performance tests are reviewed, and a comparative analysis of competing systems tested to date is presented. General Motors second generation development, the Critical Tracking Task (CTT), implemented as an alcohol ignition interlock, is described. The CTT requires the operator to stabilize the output of an unstable system whose level of instability increases monotonically up to the critical point of loss of control. Quantification of the results obtained in evaluating its potential to discriminate between sober and intoxicated performances show a great deal of promise, indicating that intoxicated failure rates of 50% for blood alcohol concentrations (BAC's) at or above 0.1% and 75% for BAC's at or above 0.14% can be attained with no sober failure rates.

HS-013 607

#### **ANALYSIS AND REPORTING OF BLOOD ALCOHOL CONCENTRATIONS OF MICHIGAN TRAFFIC FATALITIES**

HIT Lab Reports v3 n7 p1-6 (Mar 1973)

L. D. Filkins, W. L. Carlson 1973 1ref

HIT LAB Reports v3 n7 p1-6 (Mar 1973)

Blood alcohol levels, Drinking drivers, Driver fatalities, Pedestrian fatalities, Motorcycle operator fatalities, Autopsies, Michigan, Police reports, Alcohol laws

Selected data were obtained from the Michigan State Police on all 894 fatal crashes occurring in the period January 1, 1972 through June 30, 1972. Blood alcohol concentrations (BAC) had been determined and collected on 35% of the driver fatalities, 31% of the pedestrian fatalities, 29% of the cyclist fatalities, and 8% of the surviving drivers. The distributions of drivers by BAC are given for the entire state, and the BAC data collection rate on dead drivers is given by county. The statewide collection rates are also given by investigating police departments, i.e., state, sheriff, city or township. Changes in existing policies and procedures are recommended in order to increase BAC data collection.

HS-013 625

#### **A STRATEGY TO MEASURE THE PREVALANCE OF LATE SYMPTOMATIC ALCOHOLISM**

HIT Lab Reports v3 n7 p7-13 (Mar 1973)

R. L. Douglass 1973 33refs

HIT LAB Reports v3 n7 p7-13 (Mar 1973)

Alcoholism, Driver intoxication, Medical factors, Drinking drivers, Hospital records, Medical records

A methodology has been developed to produce estimates of late symptomatic alcoholism as evidenced by diagnosis of medical conditions related to alcohol abuse. The rationale is grounded in the definition of alcoholism as a disease with measurable symptoms in the late stage. The method is based on use of frequency-of-diagnosis data as a surrogate measure of morbidity for alcohol-related diseases. These data are modified by the expected incidence of alcohol abuse as a causal factor in each disease; two factors which correct for inherent duplication and lack of mutual exclusiveness within these data; and the extent to which all hospitalized patients in a jurisdiction during one reporting period are covered by the hospital data sources. The result is an estimate of the number of patients hospitalized in a specific ju-

## Field 3—HUMAN FACTORS

HSL 74, No. 1r

### Group 3A—Alcohol

risdiction for one reporting period for late symptomatic alcoholism. The relationship between alcohol and highway safety is briefly discussed.

HS-013 626

#### **ASAP TRAFFIC COURT JUDGE TRAINING. FINAL REPORT**

47P Rept. No. DOT-HS-034-2-409-73-1

Contract DOT-HS-034-2-409; Ref: NHTSA-034-1207

Report for 16 May 1972-30 Apr 1973.

NTIS

Alcohol education, Alcohol Safety Action Projects, Traffic courts, Program evaluation, Motion pictures, Planning, Scheduling, Traffic court judges

Activities undertaken to conduct the Judicial Seminar in Alcohol Safety are summarized. The activities included review and redesign of the instruction materials, instructor training, conducting the seminars, and evaluation of the educational methodology. The administrative problems encountered by this and similar nationwide educational projects are analyzed. An evaluation of the practical, short-term success of the seminars is followed by an estimate of their long-term effect on the Alcohol Safety Action Project sites. The reasons why this educational approach is a viable system for education of local personnel by use of federal funds are discussed.

HS-800 903

#### **HUMAN FACTOR VARIABLES AND FATAL VEHICULAR ACCIDENTS: A PILOT STUDY. FINAL REPORT**

Boston Univ., Mass.

For primary bibliographic entry see Fld. 1C.

HS-800 921

#### **LABORATORY EVALUATION OF ALCOHOL SAFETY INTERLOCK SYSTEMS, VOL. 1--SUMMARY REPORT**

Department of Transp., Cambridge, Mass. Systems Center

E. D. Sussman, C. N. Abernethy, 3rd 1973 34p 5refs

Contract DOT-TSC-NHTSA-73-3

Report for Aug 1971-Oct 1972.

NTIS

For abstract and search terms see HS-800 926 and HS-800 927.  
HS-800 925

### 3B. Anthropomorphic Data

#### **RESTRAINT OF CHILDREN**

General Motors Corp., Warren, Mich. Environmental Activities Staff

For primary bibliographic entry see Fld. 5N.

HS-013 605

#### **CRASH INJURY REDUCTION AND POST-CRASH FACTORS EVALUATIONS--GM-08 AND GM-09 ESVS--SIXTY-MPH FRONT-TO-REAR IMPACT. FINAL REPORT**

130P Rept. No. 2310-73-40

Contract DOT-HS-046-2-468

Rept. for Dec 1972.

NTIS

Experimental automobiles, Safety cars, Vehicle vehicle impact tests, Rear end impact tests, Crashworthiness, Occupant protection, General Motors Corp., Postcrash phase, Deformation, Crush distance, Acceleration response, Anthropomorphic dummies, Test equipment, Data acquisition, Data reduction, Head acceleration tolerances, Chest acceleration tolerances, Vehicle kinematics, Occupant kinematics, High speed impact tests

Results of a 60 mph front-to-rear crash test between two General Motors Experimental Safety Vehicles are presented. Primary objectives of the test reported were to determine the occupant and structural responses of the striking vehicle and to acquire limited data on the responses of the struck vehicle. A postcrash factors evaluation was also performed on the striking vehicle to evaluate fire hazard, rescue, and emergency egress.

HS-800 910

### 3C. Cyclists

#### **INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (2ND) PROCEEDINGS, SAN FRANCISCO, JULY 16-18, 1973. VOL. 1, PT. 1, MOTORCYCLE SAFETY 308P 90REFS**

Includes HS-013 639--HS-013 653.

Corporate author

Motorcycle safety, Motorcycle operators, Motorcycle accidents, Motorcycle handling, Helmets, Accident prevention, Age factor in accidents, Accident causes, Motorcycle operator education, Accident analysis, Accident statistics, Motorcycle riding techniques, Motorcycle operator fatalities, Motorcycle operator injuries, Motorcycle passenger fatalities, Motorcycle passenger injuries, Defensive driving, High school driving courses, Impact tests, Helmet design, Motorcycle design, Motorcycle restraint systems, Vehicle stability, Computerized simulation, Vehicle dynamics, Injury prevention

Because of the increasing popularity of motorcycles both for basic transportation and recreational activities, a conference of industry and government leaders was held to discuss aspects of motorcycle safety including motorcycle accident statistics, causes, characteristics, and age factor in accidents; motorcycle operation education; helmet design and the effectiveness of helmets and other protective clothing in accidents; and motorcycle stability and handling.

HS-013 638

#### **COMPARISON OF AGE FREQUENCY OF FATAL AND NON-FATAL MOTORCYCLE ACCIDENT VICTIMS FROM SEVERAL INTERNATIONAL GEOGRAPHICAL AREAS**

Miami Univ., Coral Gables, Fla.; Birmingham Univ. (England)

H. A. B. Wiseman, C. V. Haviland, G. M. Mackay, A. B.

Clayton 1973 12p 6 refs Rept. No. Paper-73001

HS-013 638, International Congress on Automotive Safety (2nd) Proceedings. Vol 1, Pt. 1, Motorcycle Safety, Washington, D. C., 1973

Age factor in accidents, Motorcycle operators, Motorcycle operator fatalities, Motorcycle passenger fatalities, Chi square test, Accident statistics, Fatality rates, Motorcycle operator injuries, Motorcycle passenger injuries, Motorcycle accidents, Driver age

A study was conducted to investigate whether or not the age frequency of motorcycle fatalities is the same as that for other populations of the motoring public. A data base was formed from information on the age distribution of motorcycle fatalities which occurred in Dade County, Florida; London, England; New South Wales, Australia; and the State of Washington. These data were compared with data on the age frequency of persons involved in motorcycle injury accidents. Further analysis of the data included comparison of the general U. S. driving population, the Michigan driving population, and U. S. accident population with the motorcycle fatal accident group, and to each other when age distributions were similar. A chi square test was used to analyze the data. It was concluded that in age frequency, the motorcycle fatality is different from the rest of the motoring public.

HS-013 639

#### **CONTRIBUTORY FACTORS IN MOTORCYCLE CASUALTY ACCIDENTS**

Iowa Univ., Iowa City

For primary bibliographic entry see Fld. 1C.

HS-013 640

#### **CHARACTERISTICS OF MOTORCYCLE ACCIDENTS IN JAPAN**

Honda R and D Co. Ltd., Tokyo (Japan)

For primary bibliographic entry see Fld. 1E.

HS-013 641

#### **PROMOTION OF SAFETY RIDING EDUCATION ACTIVITIES FOR MOTORCYCLISTS**

Japan Traf. Safety Assoc.

Y. Imatake 1973 15p Rept. No. Paper-73005

HS-013 638, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 1, Motorcycle Safety, Washington, D. C., 1973

Motorcycle operator education, Motorcycle riding techniques, Motorcycle safety, Accident prevention, Motorcycle accidents, Accident statistics, Niigata, Motorcycle registration, Motorcycle operator fatalities, Motorcycle operator injuries, Motorcycle passenger injuries, Age factor in accidents, Sex factor in accidents, Instructor certification, Motorcycle passenger fatalities

A marked increase in motorcycle accidents, particularly among teenagers, in Niigata in 1970 and 1971 led to revised motorcycle license examinations, compulsory wearing of helmets on all roads with speed limits over 40 kmh, and the formation of Motorcycle Safety Riding Promotion Committees. These committees have developed beginning and advanced motorcycle operator education courses, and instructor certification system, and a National Motorcycle Safety Riding Contest. Problems facing motorcycle operator education in Niigata included funding; lack of facilities for holding courses; and lack of cooperation from high schools, manufacturers, and dealers.

HS-013 642

#### **A DEFENSIVE MOTORCYCLE DRIVER**

National Safety Council, Chicago, Ill.

For primary bibliographic entry see Fld. 3E.

HS-013 643

#### **MOTORCYCLE SAFETY DRIVING EDUCATION AT A HIGH SCHOOL AND ITS RESULTS**

Hamamatsu Johoku Technical Senior High School (Japan)

For primary bibliographic entry see Fld. 3E.

HS-013 644

#### **THE YAMAHA LEARN TO RIDE SAFETY PROGRAM**

Yamaha International Corp.

For primary bibliographic entry see Fld. 3E.

HS-013 645

#### **A PRELIMINARY ANALYSIS OF SAFETY HELMET EFFECTIVENESS**

National Hwy. Traf. Safety Administration, Washington, D.C.

L. S. Buchanan, D. C. Bischoff, H. A. Richardson 1973 14p

Srefs Rept. No. Paper-73013

HS-013 638, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 1, Motorcycle Safety, Washington, D. C., 1973

Helmets, Head protection, Injury prevention, Motorcycle safety, Head injuries, Injury severity, Headgear laws, Motorcycle accidents, Accident report forms, Accident analysis, Eye protection, Speed, Bilevel accident investigation, Illinois, Michigan

Over 7,000 bilevel motorcycle accident reports from Illinois and Michigan are being studied to determine the effectiveness of helmet usage in reducing the frequency and severity of head injury. Preliminary analysis suggests that unhelmeted riders are more than three times more likely to suffer fatal head injury in an accident than are helmeted riders. Helmet usage when not required is low (about 28% in this study) and the frequency of fatal head injury is substantially lower where a helmet law is enforced. At speeds below 35 mph, unhelmeted riders are about seven times more vulnerable to fatal head injuries than helmeted riders. At speeds above 35 mph, unhelmeted riders are about three times more likely to receive fatal head injury. There is a need for greater enforcement emphasis to insure that helmets are securely fastened to minimize one cause of helmet ejection at the time of a crash.

HS-013 646

#### **THE ROLE OF HELMETS IN MOTORCYCLE ACCIDENTS**

Tokyo Jikeikai Univ. (Japan)

N. Nakamura 1973 15p Rept. No. Paper-73014

HS-013 638, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 1, Motorcycle Safety, Washington, D. C., 1973

Helmets, Motorcycle accidents, Accident analysis, Head injuries, Injury prevention, Helmet design, Age factor in accidents, Injury severity, Injury causes, Statistical analysis, Acceleration response, Helmet impact tests, Japan, Head protection

A statistical analysis of Japanese motorcycle accidents indicates that helmets are effective in reducing head injury severity. However, the highest speed at which standardized helmets provide full impact protection against fatal head injuries is low. Dummy experiments show that full impact protection cannot be expected when the impact is delivered at or near the edge of the helmet. Such impacts are not uncommon. Use of thicker plastic foam or more effective material is advisable for helmet padding. The inner surface of helmet should be completely and evenly padded to the edge of the shell.

HS-013 647



Group 3C—Cyclists

**DEVELOPMENTS IN MOTORCYCLE HELMET TESTING AND THEIR EFFECTS ON FUTURE DESIGNS**

Brown (Dayton T.), Inc., Bohemia, N. Y.  
A. A. Scalone 1973 20p 19refs Rept. No. Paper-73015  
HS-013 638, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 1, Motorcycle Safety, Washington, D. C., 1973

Helmet impact tests, Helmet standards, Helmet design, Head injuries, Fatality prevention, Drop tests, Head forms, Anthropometry, Failures, Head impact tolerances, Severity indexes, Data acquisition, Penetration tests, Head protection

Helmets suitable for motorcyclists are presently available in partial, full, and total coverage types. Present helmet standards are combinations of both absolute and comparative performance. The factors which have impeded the adoption of absolute performance requirements have been: available head injury tolerance data is insufficient to accurately describe all head injury mechanisms (as a result, the injury indices developed from these data are also limited); a test headform which responds like the human head and is suitable for certification testing is not readily available; and accident factors cannot yet be reliably reproduced in the laboratory. Improved helmet retention tests and neck, eye, and face protection standards must be developed.

HS-013 648

**SAFETY TECHNICAL DESIGN OF THE MOTORCYCLE, MOTORCYCLE HELMETS AND CLOTHING IN RELATION TO EXPERIMENTAL CRASH TESTS**

Caliber Design Ltd., Stratford (England)  
P. W. Bothwell 1973 30p Rept. No. Paper-73016  
HS-013 638, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 1, Motorcycle Safety, Washington, D. C., 1973

Motorcycle design, Helmet design, Protective clothing, Safety design, Injury prevention, Impact attenuation, Barrier collision tests, Head on impact tests, Vehicle vehicle impact tests, Front end impact tests, Angle impact tests, Ejection, Anthropometric dummies, Rear end impact tests, Side impact tests, Skidding, Energy absorbing systems, Vehicle motorcycle collisions, Crashworthy fuel tanks, Forks, Motorcycle restraint systems, Air bag restraint systems, Impact velocity, Restraint system tests, Restraint system effectiveness

Fifty head on, front end, angle, rear end, side, and vehicle vehicle impact tests and barrier collision tests were conducted to assess motorcycle crashworthiness, protection provided by helmets and other clothing, and the effectiveness of motorcycle air bag restraint systems. It is concluded that crashworthy fuel tanks to prevent rupture; more protection for the head, neck, and chest of ejected motorcyclists; and energy absorbing crash bars are needed. Air bags fitted to motorcycles can protect the rider's head and torso against side impacts with vehicles and prevent ejection in head on impacts. With the type of air bag presently used, the wider the impact angle the less the likelihood of protection.

HS-013 649

**A MANUAL CONTROL VIEW OF MOTORCYCLE HANDLING**

Systems Technology, Inc., Hawthorne, Calif.

For primary bibliographic entry see Fld. 5C.  
HS-013 650

**PEDESTRIAN AND BICYCLE SAFETY EDUCATION: A TEACHER'S GUIDE**

Temple City Unified School District, Calif.  
For primary bibliographic entry see Fld. 3K.  
HS-845 021

**3D. Driver Behavior**

**HIGHWAY ACCIDENT REPORT. PROPANE TRACTOR-SEMITRAILER OVERTURN AND FIRE, U.S. ROUTE 501, LYNCHBURG, VIRGINIA, MARCH 9, 1972**

29P 12REFS Rept. No. NTSB-HAR-73-3, 55-H-21

Contains Highway Safety Recommendations H-73-20 through H-73-29.  
Corporate author

Truck overturn accidents, Accident case reports, Tractor semitrailers, Accident caused fires, Driver error caused accidents, Tank trucks, Propane, Accident causes, Burns, Fatality causes, Injury causes, Wrong way driving, Truck center of gravity, Accident location, Vehicle fixed object collisions, Vehicle characteristics, Property damage accidents, Driver emergency responses, Accident prevention, Transportation of hazardous materials, Driver licensing, Driver records, Warning signs, Accident analysis, Damage severity, Road grades, Road curves, Truck stability, Traffic signs, Centerline markings, Ruptures, Vehicle design, Lynchburg, Driver characteristics, Vehicle dynamics

A tractor semitrailer (tank) carrying pressurized liquid propane overturned at 2:30 p.m. After overturning, the vehicle slid on its side and struck a rock embankment, which ruptured the tank shell and permitted the propane to escape. When the propane-air mixture ignited, two persons, including the truck driver, were killed, and five others were injured. The cause of the overturn was the driving of the tractor semitrailer on the wrong side of the road, and a subsequent evasive steering action which exceeded the limited capability of the truck to resist overturn. Contributing factors included a misleading traffic sign, an inadequate centerline marking, and the high center of gravity of the truck. The causes of the burn fatalities and injuries were rupture of the tank at a point susceptible to rupture and the inadequacy of the required placards as a means of warning bystanders of the nature and range of the hazard.

HS-013 627

**A DEFENSIVE MOTORCYCLE DRIVER**

National Safety Council, Chicago, Ill.  
For primary bibliographic entry see Fld. 3E.  
HS-013 643

**MOTORCYCLE SAFETY DRIVING EDUCATION AT A HIGH SCHOOL AND ITS RESULTS**

Hamamatsu Johoku Technical Senior High School (Japan)  
For primary bibliographic entry see Fld. 3E.  
HS-013 644

**MULTIDISCIPLINARY ACCIDENT INVESTIGATIONS, PHASE 1. FINAL REPORT**

University of Southern California, Los Angeles  
For primary bibliographic entry see Fld. 1C.

HS-800 876

**DRIVER PERFORMANCE MEASUREMENT RESEARCH. VOL. 2. GUIDE FOR TRAINING OBSERVER/RATERS IN THE DRIVER PERFORMANCE MEASUREMENT PROCEDURE. FINAL REPORT**

Michigan State Univ., East Lansing  
R. O. Nolan, F. E. Vanosdall, D. L. Smith 1973 217p  
Contract FH-11-7627  
Vol. 1 is HS-800 881.  
NTIS

Driver performance, Driver monitoring, Instruction materials, Driver behavior, Driver education evaluation, Driving task analysis, Curricula, Driver behavior research, Visual aids, Rural highways, Residential streets, Suburban roads, Central business districts, Urban areas, Accident avoidance, Interchanges

A training course plan and content materials used and evaluated in training driver education practitioners to observe and rate the adequacy and safety of driver behavior patterns in selected Behavioral-Environmental-Traffic-Situational-Sequences (BETSS) and their sub-divisions (SubBETSS) are presented. The training provides for orientation, field observations, and practice in making observations and individual ratings of subject drivers. The introductory materials give background information on the project, on the need for training, and on the types of persons who should be trained. The course plan and content materials include examples and illustrations of BETSS actually used in developing the method and which may be used as a basis for establishing equivalent BETSS in other locations.  
HS-800 882

**HUMAN FACTORS COUNTERMEASURES TO IMPROVE HIGHWAY-RAILWAY INTERSECTION SAFETY. FINAL REPORT**

Biotechnology, Inc., Falls Church, Va.  
J. H. Sanders, Jr., G. S. Kolsrud, W. G. Berger 1973 235p 41refs  
Contract DOT-HS-190-2-300  
Report for 31 Mar 1972-4 Jun 1973.  
NTIS

Railroad grade crossing accidents, Accident prevention, Driver behavior, Driver attitudes, Driver performance, Accident studies, Human factors, Demonstration projects, Accident factors, Accident statistics, Railroad grade crossings, Questionnaires, Search performance, Head movement, Accident causes, Driver reaction time, Attention, Driver education, Safety campaigns, Driver license examination, Traffic law enforcement, Data acquisition, Vehicle detectors, Data processing, Data analysis, Time lapse photography, Speed, Speed reduction, Visual perception, Auditory perception

Investigations of railroad grade crossing accidents showed that maintenance of protective warning devices, driver attention, and driver expectancy were precipitating and predisposing factors in these accidents. An appraisal of inherent driver safety potential was made which included driver education and licensing, safety programs and law enforcement, attitudes, and psychophysiological capabilities and limitations. Information on driver behavior, knowledge, and attitudes was obtained in a demonstration field study conducted in five states. Three data collection procedures used were the Traffic Evaluator System, time-lapse photography, and motorist response to question-

naires. An extensive analysis was performed on the data obtained to suggest railroad grade crossing accident countermeasure concepts and to determine target populations for effective countermeasures intervention. Under restricted conditions, driver looking behavior, crossing speed, and speed decrease were shown to be valid measures of driver performance to evaluate the effectiveness of a countermeasures intervention.  
HS-800 888

**HUMAN FACTOR VARIABLES AND FATAL VEHICULAR ACCIDENTS: A PILOT STUDY. FINAL REPORT**

Boston Univ., Mass.  
For primary bibliographic entry see Fld. 1C.  
HS-800 921

**LABORATORY EVALUATION OF ALCOHOL SAFETY INTERLOCK SYSTEMS, VOL. 1--SUMMARY REPORT**

Department of Transp., Cambridge, Mass. Systems Center  
For primary bibliographic entry see Fld. 3A.  
HS-800 925

**3E. Driver Education**

**MANUAL FOR CALIFORNIA'S SCHOOL BUS DRIVER INSTRUCTOR COURSE**

California Dept. of Education, Sacramento  
F. Sowash, comp. 1972 446p  
Corporate author

Driver education manuals, Curricula, School bus drivers, Instructor training, California, Insurance, First aid, Emergency services, Defensive driving, Child safety, Driver tests, Public relations, Vehicle characteristics, Fire extinguishers, Failures, Escape from vehicle, Communication systems, School bus passengers, Psychological factors, Mental retardation, Handicapped passengers, Entering and leaving transit vehicles, Transportation of handicapped, Visual aids

A school bus driver instructor program designed to train instructors in numbers large enough to train or retrain all the school bus drivers in the state has been developed in California. This manual acts as a course of study for instructors while they are in the process of being trained; provides graduate instructors with organized material that can be easily adapted for use on the local level; and acts as an in-depth reference book for the graduates of the School Bus Driver Instructor Course. Topics covered include public relations; procedures for becoming a school bus driver; driver certification; school bus use, operation, and driving fundamentals; insurance; vehicle components; first aid; emergency procedures; defensive driving; discipline; mentally retarded and physically handicapped children; and a state plan for pupil transportation. Driver tests are also included.

HS-013 628

**INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (2ND) PROCEEDINGS, SAN FRANCISCO, JULY 16-18, 1973. VOL. 1, PT. 1, MOTORCYCLE SAFETY**

**308P 90REFS**

Includes HS-013 639--HS-013 653.  
Corporate author



B5



## Field 3—HUMAN FACTORS

HSL 74, No. 1r

### Group 3E—Driver Education

Motorcycle safety, Motorcycle operators, Motorcycle accidents, Motorcycle handling, Helmets, Accident prevention, Age factor in accidents, Accident causes, Motorcycle operator education, Accident analysis, Accident statistics, Motorcycle riding techniques, Motorcycle operator fatalities, Motorcycle operator injuries, Motorcycle passenger fatalities, Motorcycle passenger injuries, Defensive driving, High school driving courses, Impact tests, Helmet design, Motorcycle design, Motorcycle restraint systems, Vehicle stability, Computerized simulation, Vehicle dynamics, Injury prevention

Because of the increasing popularity of motorcycles both for basic transportation and recreational activities, a conference of industry and government leaders was held to discuss aspects of motorcycle safety including motorcycle accident statistics, causes, characteristics, and age factor in accidents; motorcycle operation education; helmet design and the effectiveness of helmets and other protective clothing in accidents; and motorcycle stability and handling.

HS-013 638

### CONTRIBUTORY FACTORS IN MOTORCYCLE CASUALTY ACCIDENTS

Iowa Univ., Iowa City

For primary bibliographic entry see Fld. 1C.

HS-013 640

### PROMOTION OF SAFETY RIDING EDUCATION ACTIVITIES FOR MOTORCYCLISTS

Japan Traf. Safety Assoc.

For primary bibliographic entry see Fld. 3C.

HS-013 642

### A DEFENSIVE MOTORCYCLE DRIVER

National Safety Council, Chicago, Ill.

F. Potenza 1973 23p Rept. No. Paper-73006

HS-013 638, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 1, Motorcycle Safety, Washington, D. C., 1973

Motorcycle operators, Defensive driving, Motorcycle operator experience, Driver age, Driver skills, Motorcycle operator education, Classroom driver instruction, Behind the wheel instruction, Slides (visual aids), Accident avoidance, Following distance, Hazard perception, Motorcycle visibility, Motorcycle riding techniques, Weather, Accident rates, National Safety Council

Most operators involved in motorcycle accidents are under age 25. A comprehensive safety education program is needed for every new motorcycle operator during his first six months behind the handlebars when he is developing the control skills necessary to operate the vehicle. This period is also the best time for maximizing the interest and cooperation of the motorcycle operator and his parents. Motorcycle dealers, high schools, and local safety and service organizations should assume responsibility for motorcycle operator education. The Defensive Driving Course for motorcycle operators is described. The United States Army Command has developed a successful behind the wheel course for motorcycle operators.

HS-013 643

### MOTORCYCLE SAFETY DRIVING EDUCATION AT A HIGH SCHOOL AND ITS RESULTS

Hamamatsu Johoku Technical Senior High School (Japan)

Y. Sugie 1974 13p Rept. No. Paper-73007

HS-013 638, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 1, Motorcycle Safety, Washington, D. C., 1973

Motorcycle operator education, High school driving courses, Driver education evaluation, Driver education effectiveness, Accident prevention, Japan, Accident rates, Motorcycle accidents, Psychological factors, Adolescent drivers, Classroom driver instruction, Audiovisual aids, Behind the wheel instruction, Traffic law violations, Motorcycle riding techniques

A motorcycle operator education course given at the Hamamatsu Johoku Technical Senior High School in Japan, which incorporated classroom instruction, audio-visual aids, and behind the wheel instruction, was effective in reducing student motorcycle accidents and traffic law violations from 65 to 29 between 1965 and 1970. Other similar courses have also been effective in lowering motorcycle accident rates. Methods of instruction are briefly outlined.

HS-013 644

### THE YAMAHA LEARN TO RIDE SAFETY PROGRAM

Yamaha International Corp.

T. Tiernan 1973 15p Rept. No. Paper-73008

HS-013 638, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 1, Motorcycle Safety, Washington, D. C., 1973

Motorcycle operator education, Driver education evaluation, Classroom driver instruction, Behind the wheel instruction, Yamaha International Corp., Motorcycle riding techniques

The Yamaha Learn to Ride Safety Program will be conducted in 120 major cities throughout the United States in 1973. This program is the partial solution to industry figures which indicate that approximately 60% of motorcycle accidents and fatalities occur among operators with less than six weeks experience. The program was designed to instruct non and/or new motorcycle operators on the fundamental techniques and procedures for safe riding. Research from initial pilot markets indicated 65% of those who attended a Learn-to-Ride event have never ridden a motorcycle previously. Participants are given a 20 minute lecture and 30 minutes of behind the wheel instruction. A follow up Rider Safety Course consisting of one hour of classroom instruction and one hour of driving has also been developed to be given two weeks after the Learn to Ride Safety Program.

HS-013 645

### DRIVER PERFORMANCE MEASUREMENT RESEARCH. VOL. 2. GUIDE FOR TRAINING OBSERVER/RATERS IN THE DRIVER PERFORMANCE MEASUREMENT PROCEDURE. FINAL REPORT

Michigan State Univ., East Lansing

For primary bibliographic entry see Fld. 3D.

HS-800 882

### BASIC TRAINING PROGRAM FOR DRIVER IMPROVEMENT ANALYST. FINAL REPORT

Dunlap and Associates, Inc., Darien, Conn.

A. Hale 1973 46p 76refs Rept. No. ED-73-9

Contract DOT-HS-099-2-474

Report for 28 Jun 1972-28 Jun 1973.

NTIS

Driver improvement, Curricula, Driver improvement measurement, Problem drivers, Education, Driver improvement analysts

The steps taken to develop a training program to prepare the driver improvement analyst for entry-level service are briefly summarized. The training requirements analysis, course outline, and the organization of training modules and training objectives are included. Recommendations for further efforts in this area are presented.

HS-800 913

### 3F. Driver Licensing

#### BASIC TRAINING PROGRAM FOR DRIVER LICENSE EXAMINER SUPERVISORS--CONCEPTS AND RECOMMENDATIONS. FINAL TECHNICAL REPORT

Technical Education Res. Centers, Inc., Champaign, Ill.

J. T. Pendleton, C. D. Patton 1973 32p

Contract DOT-HS-100-2-391

Report for 30 Jun 1972-30 Jun 1973.

NTIS

Driver license examiners, Curricula, Program evaluation, Questionnaires, Flow charts, Education

An instructional-system process was followed in the development of this curriculum project. An integral part of the developmental methodology was the evaluation design of the curriculum project. The curriculum was reviewed by the project staff and a field task force, and changes were made; the materials were then evaluated by three individuals who were to implement the curriculum; and a field test of the curriculum was conducted in which 20 California Driver License Examiner Supervisors were trained. Evaluations were made on a daily and summary basis by all field test participants. The Training Program Course Outline and the evaluation instruments used by the field test workshop participants and directors are included.

HS-800 904

#### DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 1, SYSTEM DESIGN AND DEVELOPMENT

234P 99REFS

GPO

Information system design, Traffic records, Computerized records management, Data banks, Automated accident records, Data acquisition, Data processing, Data analysis, Data transmission, Telecommunication, Computerized driver records, Computer programs, Information retrieval, Systems engineering, Communication systems, Manuals, State planning, Manuals

The manual provides the recommended content and operational concepts for a comprehensive traffic records system incorporating a totally integrated data base which addresses the many traffic safety program areas. Details are given of descriptions of the system organization, subsystem functional design, data file organization, system data analysis and reporting concepts, telecommunications and data processing facilities, alternative techniques and equipment for data collection and conversion, data processing, data communications, data output and dissemination, techniques for definition of specific user-oriented requirements and for translation of these requirements

into specific system performance and design requirements, and procedures and content requirements for preparation of procurement specifications for system hardware and software. Recommended procedures for system implementation and acceptance testing to assure the proper installation and operation of the system are also described.

HS-820 270

#### DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 1, DRIVER DATA SUBSYSTEM

62P

GPO

Information system design, Computerized records management, Computerized driver records, Coding systems, Driver licensing, Data processing, State planning, Vehicle registration, Manuals, Traffic records

The Driver Data Subsystem of the State Traffic Records System is designed to support the State's activities associated with driver licensing; provide a comprehensive correlation of licensed drivers and vehicles registered in their names; support and facilitate the State's driver control programs; and support the administration of the State's financial responsibility laws and collection of fees associated with driver licensing. The subsystem consists of a driver/owner directory file, a driver history file, and a financial responsibility file. The data contents of the three subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 271

### 3K. Pedestrians

#### PEDESTRIAN AND BICYCLE SAFETY EDUCATION: A TEACHER'S GUIDE

Temple City Unified School District, Calif.

E. Aguirre 1972 80p

Sponsored by California Office of Traf. Safety and National Hwy. Traf. Safety Administration.

NTIS

Child safety education, Pedestrian education, Bicycle safety, Pedestrian safety, Curricula, Emergency training, Temple City, Instruction materials

The curriculum designed for an elementary school safety program covering pedestrian safety, bicycle safety, and safety in emergency situations is presented. Content, learning experience, and evaluation are given for each subject. Enrichment materials include poems, bulletin board poster suggestions, songs, and pamphlet and film titles.

HS-845 021

## 4. OTHER SAFETY-RELATED AREAS

### 4B. Community Support

#### DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 1, SYSTEM DESIGN AND DEVELOPMENT

234P 99REFS

GPO

**Group 4B—Community Support**

Information system design, Traffic records, Computerized records management, Data banks, Automated accident records, Data acquisition, Data processing, Data analysis, Data transmission, Telecommunication, Computerized driver records, Computer programs, Information retrieval, Systems engineering, Communication systems, Manuals, State planning, Manuals

The manual provides the recommended content and operational concepts for a comprehensive traffic records system incorporating a totally integrated data base which addresses the many traffic safety program areas. Details are given of descriptions of the system organization, subsystem functional design, data file organization, system data analysis and reporting concepts, telecommunications and data processing facilities, alternative techniques and equipment for data collection and conversion, data processing, data communications, data output and dissemination, techniques for definition of specific user-oriented requirements and for translation of these requirements into specific system performance and design requirements, and procedures and content requirements for preparation of procurement specifications for system hardware and software. Recommended procedures for system implementation and acceptance testing to assure the proper installation and operation of the system are also described.

HS-820 270

**DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 1, DRIVER DATA SUBSYSTEM**  
62P

GPO

Information system design, Computerized records management, Computerized driver records, Coding systems, Driver licensing, Data processing, State planning, Vehicle registration, Manuals, Traffic records

The Driver Data Subsystem of the State Traffic Records System is designed to support the State's activities associated with driver licensing; provide a comprehensive correlation of licensed drivers and vehicles registered in their names; support and facilitate the State's driver control programs; and support the administration of the State's financial responsibility laws and collection of fees associated with driver licensing. The subsystem consists of a driver/owner directory file, a driver history file, and a financial responsibility file. The data contents of the three subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 271

**4C. Cost Effectiveness**

**MISSISSIPPI HIGHWAY SAFETY INFORMATION SYSTEM**

64P Rept. No. SSDC-TR-72-371

Sponsored by Mississippi Central Data Processing Authority.  
Reference copy only

Computerized records management, Automated accident records, Computerized driver records, Information systems, Mississippi, Flow charts, Driver identification, Data acquisition, Data processing, Vehicle registration, Licensing, Highway accident potential, Accident location, Communication systems,

Planning, Emergency medical services, Traffic records, Automated law enforcement systems, Benefit cost analysis

Mississippi is developing a Highway Safety Information System (MHSIS) which will provide the information needed to assess existing highway safety programs and conditions, build new programs, and evaluate the results of the new program; support the highway safety related regulatory and operational requirements of each highway safety agency; operate within existing legislation; build upon the existing computer subsystems and be in accord with the CDPA Computer Master Plan and the Criminal Justice Information System Plan; and provide cost-effective information services. To meet these requirements the HSIS will include driver, vehicle, accident, highway/roadway, and communications information subsystems. In the future the MHSIS will also encompass emergency medical services, a local traffic records system, and a selective enforcement program.

HS-013 619

**COST EFFECTIVENESS OF EMISSION CONTROL**

For primary bibliographic entry see Fld. 2G.

HS-013 629

**INSPECTION AND MAINTENANCE FOR REDUCING AUTOMOBILE EMISSIONS. EFFECTIVENESS AND COST**

For primary bibliographic entry see Fld. 5F.

HS-013 630

**THE EFFECTIVENESS AND COST OF RETROFIT FOR REDUCING AUTOMOBILE EMISSIONS**

For primary bibliographic entry see Fld. 5F.

HS-013 631

**ACCIDENT EXPERIENCE WITH HI DRO CUSHIONS IN SEATTLE--A TOPICS EVALUATION REPORT**

For primary bibliographic entry see Fld. 2D.

HS-013 633

**4E. Information Technology**

**SAN MATEO COUNTY COMPUTERIZED ACCIDENT RECORDS SYSTEM (CARES). FINAL REPORT**

Stanford Res. Inst., Menlo Park, Calif.

For primary bibliographic entry see Fld. 2K.

HS-013 616

**SAN MATEO COUNTY COMPUTERIZED ACCIDENT RECORDS SYSTEM (CARES) USERS MANUAL. TECHNICAL NOTE**

Stanford Res. Inst.

For primary bibliographic entry see Fld. 2K.

HS-013 617

**MISSISSIPPI HIGHWAY SAFETY INFORMATION SYSTEM**

64P Rept. No. SSDC-TR-72-371

Sponsored by Mississippi Central Data Processing Authority.  
Reference copy only

Computerized records management, Automated accident records, Computerized driver records, Information systems, Mississippi, Flow charts, Driver identification, Data acquisition, Data processing, Vehicle registration, Licensing, Highway accident potential, Accident location, Communication systems, Planning, Emergency medical services, Traffic records, Automated law enforcement systems, Benefit cost analysis

Mississippi is developing a Highway Safety Information System (MHSIS) which will provide the information needed to assess existing highway safety programs and conditions, build new programs, and evaluate the results of the new program; support the highway safety related regulatory and operational requirements of each highway safety agency; operate within existing legislation; build upon the existing computer subsystems and be in accord with the CDPA Computer Master Plan and the Criminal Justice Information System Plan; and provide cost-effective information services. To meet these requirements the HSIS will include driver, vehicle, accident, highway/roadway, and communications information subsystems. In the future the MHSIS will also encompass emergency medical services, a local traffic records system, and a selective enforcement program.

HS-013 619

#### **REVIEW OF MULTIDISCIPLINARY ACCIDENT INVESTIGATION (MDAI) REPORT AUTOMATION AND UTILIZATION PROGRAM**

For primary bibliographic entry see Fld. 1C.

HS-013 623

#### **DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 1, SYSTEM DESIGN AND DEVELOPMENT**

234P 99REFS

GPO

Information system design, Traffic records, Computerized records management, Data banks, Automated accident records, Data acquisition, Data processing, Data analysis, Data transmission, Telecommunication, Computerized driver records, Computer programs, Information retrieval, Systems engineering, Communication systems, Manuals, State planning, Manuals

The manual provides the recommended content and operational concepts for a comprehensive traffic records system incorporating a totally integrated data base which addresses the many traffic safety program areas. Details are given of descriptions of the system organization, subsystem functional design, data file organization, system data analysis and reporting concepts, telecommunications and data processing facilities, alternative techniques and equipment for data collection and conversion, data processing, data communications, data output and dissemination, techniques for definition of specific user-oriented requirements and for translation of these requirements into specific system performance and design requirements, and procedures and content requirements for preparation of procurement specifications for system hardware and software. Recommended procedures for system implementation and acceptance testing to assure the proper installation and operation of the system are also described.

HS-820 270

#### **DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 1, DRIVER DATA SUBSYSTEM**

62P

GPO

Information system design, Computerized records management, Computerized driver records, Coding systems, Driver licensing, Data processing, State planning, Vehicle registration, Manuals, Traffic records

The Driver Data Subsystem of the State Traffic Records System is designed to support the State's activities associated with driver licensing; provide a comprehensive correlation of licensed drivers and vehicles registered in their names; support and facilitate the State's driver control programs; and support the administration of the State's financial responsibility laws and collection of fees associated with driver licensing. The subsystem consists of a driver/owner directory file, a driver history file, and a financial responsibility file. The data contents of the three subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 271

#### **DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 2, VEHICLE DATA SUBSYSTEM**

81P

GPO

Information system design, Computerized records management, Coding systems, Data processing, Automatic vehicle identification, Vehicle registration, Traffic records, State planning, Manuals

The Vehicle Data Subsystem of the State Traffic Records System is designed to support State functions related to the registration of motor vehicles; provide for collection and maintenance of data related to the mechanical condition of vehicles registered in the State; provide for collection and maintenance of history records related to the theft and abandonment of motor vehicles; and support State administrative functions related to titling and lien laws for vehicular property. The subsystem consists of a vehicle identification directory file, a registration data file, a vehicle history file, a stolen, abandoned, and lost property data file, and a titling and financial data file. The data contents of the subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 272

#### **DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 3, ROADWAY ENVIRONMENT DATA SUBSYSTEM**

121P

GPO

Information system design, Computerized records management, Data processing, Coding systems, Highway location, Highway characteristics, Manuals, State planning, Traffic records, Intersections, Bridges

## Field 4—OTHER SAFETY-RELATED AREAS

HSL 74, No. 1r

### Group 4E—Information Technology

The Roadway Environment Data Subsystem of the State Traffic Records System is designed to provide an inventory of the State primary and secondary roadway facilities; support the operational functions of roadway planning, management of traffic operations, and roadway maintenance; and provide the information necessary for the identification of safety problems and determination of remedial actions. The subsystem consists of a roadway location directory file, a basic roadway characteristics file, an intersection characteristics file, a bridge structure inventory file, and a roadway location history file. The data contents of the five subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 273

#### **DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 4, ACCIDENT DATA SUBSYSTEM**

199P

GPO

Information system design, Computerized records management, Coding systems, Data processing, Automated accident records, Traffic records, Manuals, State planning

The Accident Data Subsystem of the State Traffic Records System has the primary functional objective of serving the operational requirements related to the collection and maintenance of data on traffic accidents occurring within the State. The subsystem also serves as the central focus of the integrated traffic records system data base, providing a main thread in the interlinking of files within the system and traffic safety analyses conducted from the data within these files. To accomplish this, the subsystem data contents provide linkage data elements for access to the other subsystems. The subsystems consists of an accident case directory file, a basic case data file, a fatalities analysis supplement file, and an in-depth investigation supplement file. The data contents of the four subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 274

#### **DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 5, EMERGENCY SERVICES DATA SUBSYSTEM**

65P

GPO

Information system design, Computerized records management, Coding systems, Data processing, Emergency medical services, Manuals, Emergency services, State planning, Traffic records

The Emergency Services Data Subsystem of the State Traffic Records System is designed to maintain an inventory of available organizations providing emergency services in response to traffic accidents and other emergency events on a State-wide basis; permit effective monitoring of the operations of the emergency services organizations in response to emergency situations; provide support to State agencies responsible for planning, implementation, and evaluation of emergency medical services (EMS) programs; and aid in the administration of ser-

vice unit licensing, where applicable. The subsystem consists of an emergency services directory file, an emergency medical services inventory file, a hospital/medical center emergency room inventory file, and an EMS operations file. The data contents of the four subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.

HS-820 275

### 4G. Mathematical Sciences

#### **A PRELIMINARY STUDY OF MODELING THE AIR POLLUTION EFFECTS FROM TRAFFIC ENGINEERING ALTERNATIVES**

For primary bibliographic entry see Fld. 2G.

HS-013 632

#### **FACTORS AFFECTING VEHICLE SKIDS: A BASIS FOR WET WEATHER SPEED ZONING. INTERIM REPORT**

Texas A and M Univ., College Station. Texas Transp. Inst.

For primary bibliographic entry see Fld. 2D.

HS-013 635

#### **A MANUAL CONTROL VIEW OF MOTORCYCLE HANDLING**

Systems Technology, Inc., Hawthorne, Calif.

For primary bibliographic entry see Fld. 5C.

HS-013 650

#### **THE STEADY STATE AND TRANSIENT HANDLING CHARACTERISTICS OF A MOTORCYCLE**

Cranfield Inst. of Tech., Beds. (England)

For primary bibliographic entry see Fld. 5C.

HS-013 651

#### **SIMULATION STUDY OF MOTORCYCLE STABILITY AT HIGH SPEED**

Calspan Corp., Buffalo, N. Y.

For primary bibliographic entry see Fld. 5C.

HS-013 652

#### **LATERAL DYNAMICS OF THE UNCONTROLLED MOTORCYCLE**

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.

For primary bibliographic entry see Fld. 5C.

HS-013 653

#### **BASIC RESEARCH IN CRASHWORTHINESS**

##### **2--LARGE DEFLECTION COMPUTERIZED**

##### **ANALYSIS OF RATE SENSITIVE ELASTO-PLASTIC FRAME STRUCTURES. INTERIM TECHNICAL REPORT**

Calspan Corp., Buffalo, N. Y.

For primary bibliographic entry see Fld. 5D.

HS-800 884

#### **STABILITY AND HANDLING CRITERIA OF ARTICULATED VEHICLES, SUMMARY. FINAL REPORT**

IIT Res. Inst., Chicago, Ill.

For primary bibliographic entry see Fld. 5R.

HS-800 914

**STABILITY AND HANDLING CRITERIA OF ARTICULATED VEHICLES, PT. 2, AVDS3 USER'S MANUAL. FINAL REPORT**

IIT Res. Inst., Chicago, Ill.

For primary bibliographic entry see Fld. 5R.

HS-800 916

**DEVELOPMENT OF COMPLIANCE TEST PROCEDURES FOR FEDERAL MOTOR VEHICLE SAFETY STANDARD 215--EXTERIOR PROTECTION--PASSENGER CARS. FINAL REPORT**

Calspan Corp., Buffalo, N. Y.

For primary bibliographic entry see Fld. 5Q.

HS-800 918

**MULTIDISCIPLINARY ACCIDENT INVESTIGATIONS--PHASE 2. FINAL REPORT**

University of Southern Calif., Los Angeles

For primary bibliographic entry see Fld. 1C.

HS-800 920

**5. VEHICLE SAFETY**

**5A. Brake Systems**

**FACTORS AFFECTING VEHICLE SKIDS: A BASIS FOR WET WEATHER SPEED ZONING. INTERIM REPORT**

Texas A and M Univ., College Station. Texas Transp. Inst.

For primary bibliographic entry see Fld. 2D.

HS-013 635

**5B. Buses, School Buses, And Multipurpose Passenger Vehicles**

**MANUAL FOR CALIFORNIA'S SCHOOL BUS DRIVER INSTRUCTOR COURSE**

California Dept. of Education, Sacramento

For primary bibliographic entry see Fld. 3E.

HS-013 628

**5C. Cycles**

**INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (2ND) PROCEEDINGS, SAN FRANCISCO, JULY 16-18, 1973. VOL. 1, PT. 1, MOTORCYCLE SAFETY**

308P 90RFFS

Includes HS-013 639--HS-013 653.

Corporate author

Motorcycle safety, Motorcycle operators, Motorcycle accidents, Motorcycle handling, Helmets, Accident prevention, Age factor in accidents, Accident causes, Motorcycle operator education, Accident analysis, Accident statistics, Motorcycle riding techniques, Motorcycle operator fatalities, Motorcycle operator injuries, Motorcycle passenger fatalities, Motorcycle passenger injuries, Defensive driving, High school driving courses, Impact tests, Helmet design, Motorcycle design, Motorcycle restraint systems, Vehicle stability, Computerized simulation, Vehicle dynamics, Injury prevention

Because of the increasing popularity of motorcycles both for basic transportation and recreational activities, a conference of industry and government leaders was held to discuss aspects of motorcycle safety including motorcycle accident statistics, causes, characteristics, and age factor in accidents; motorcycle operation education; helmet design and the effectiveness of helmets and other protective clothing in accidents; and motorcycle stability and handling.

HS-013 638

**CONTRIBUTORY FACTORS IN MOTORCYCLE CASUALTY ACCIDENTS**

Iowa Univ., Iowa City

For primary bibliographic entry see Fld. 1C.

HS-013 640

**CHARACTERISTICS OF MOTORCYCLE ACCIDENTS IN JAPAN**

Honda R and D Co. Ltd., Tokyo (Japan)

For primary bibliographic entry see Fld. 1E.

HS-013 641

**A PRELIMINARY ANALYSIS OF SAFETY HELMET EFFECTIVENESS**

National Hwy. Traf. Safety Administration, Washington, D.C.

For primary bibliographic entry see Fld. 3C.

HS-013 646

**THE ROLE OF HELMETS IN MOTORCYCLE ACCIDENTS**

Tokyo Jikeikai Univ. (Japan)

For primary bibliographic entry see Fld. 3C.

HS-013 647

**A MANUAL CONTROL VIEW OF MOTORCYCLE HANDLING**

Systems Technology, Inc., Hawthorne, Calif.

D. H. Weir 1973 18p 15refs Rept. No. Paper-73018

HS-013 638, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 1, Motorcycle Safety, Washington, D. C., 1973

Motorcycle handling, Vehicle control, Driver performance, Motorcycle performance, Vehicle dynamics, Motorcycle design, Degrees of freedom, Equations of motion, Roll, Motorcycle operators, Vehicle stability

Lateral-directional motorcycle control by means of upper body lean and steer torque is analyzed. Rider dynamic response properties, alternative perceptual cues, and motorcycle equations of motion are summarized. The motorcycle degrees of freedom included are lateral velocity, roll angle, heading rate, and front fork steer angle. The resulting motorcycle motions are characterized by a low frequency capsize mode, and two high frequency modes involving weaving and front fork assembly wobble. A number of rider feedback loops (control response to perceptual cues) are reviewed to determine those which satisfy both rider-centered and guidance and control requirements. A representative multiple-loop rider/cycle system control structure is shown, which serves to quantify rider/cycle response and performance, and provides a basis for determining the effect on handling performance of changes in cycle design configuration.

HS-013 650



## Group 5C—Cycles

**THE STEADY STATE AND TRANSIENT HANDLING CHARACTERISTICS OF A MOTORCYCLE**

Cranfield Inst. of Tech., Beds. (England)

J. R. Ellis, G. F. Hayhoe 1973 23p 5refs Rept. No. Paper-73019 HS-013 638, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 1, Motorcycle Safety, Washington, D. C., 1973

Motorcycle handling, Steady state, Computerized simulation, Cornering, Steering, Degrees of freedom, Roll, Yaw, Camber, Tire tests, Tire side forces, Torque, Pitch, Equations of motion, Mathematical models, Control equipment

A nonlinear, four degree of freedom digital simulation of a motorcycle has been developed. The equations of motion have freedom in the lateral, roll, yaw, and steering modes, and the system comprises the main frame plus the rider, the steering and front wheel masses, a rotating front wheel, and a rotating rear wheel and engine. A geometrical analysis of the steering system and lateral tire forces for camber angles of up to 40 degrees is included. Steady state cornering characteristics of a specific motorcycle, as predicted by the simulation, are compared with results obtained from an instrumented motorcycle. Addition of a steering controller to the model allowed transient behavior to be studied and compared with experimental results. A seven degree of freedom, nonlinear model is described which has pitch, bounce, and variable forward speed added to the four degrees of freedom of the simpler model. Results obtained from the two models are compared.

HS-013 651

**SIMULATION STUDY OF MOTORCYCLE STABILITY AT HIGH SPEED**

Calspan Corp., Buffalo, N. Y.

R. D. Roland 1973 19p 19refs Rept. No. Paper-73020 HS-013 638, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 1, Motorcycle Safety, Washington, D. C., 1973

Motorcycle stability, High speed, Motorcycle handling, Computerized simulation, Wheel wobble, Weaving, Degrees of freedom, Tire side forces, Torque, Camber, Tire slip motion, Pitch, Aerodynamic configurations, Drag, Damping, Steering, Yaw, Sideslip, Roll, Gyroscopic motion, Forks, Moments of inertia, Motorcycle design, Oscillation, Mathematical models

A digital computer simulation of a two-wheel vehicle and rider was developed to study motorcycle stability and handling. Tire side force and aligning torque, camber angle, vertical load, aerodynamic drag, pitching moment, steering torque, steering damping, and gyroscopic effects of the engine and wheels are modeled as well as fork rake angle, steering trail, and the physical characteristics of the frame, steering assembly, and rider. Time histories of the vehicle motion variables are produced. This simulation was validated by comparison with tests using an instrumented vehicle. A combined program has been conducted by Calspan Corp. and the Harley-Davidson Motor Co., Inc. to study weave instability of motorcycles at high speed, which is characterized by coupled steer-roll-yaw motions. The influence of several motorcycle characteristics on weave instability has been evaluated in the context of system performance by simulating high speed disturbance-response behavior.

HS-013 652

**LATERAL DYNAMICS OF THE UNCONTROLLED MOTORCYCLE**

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.

D. J. Eaton, L. Segel 1973 23p 7refs Rept. No. Paper-73021 HS-013 638, International Congress on Automotive Safety (2nd) Proceedings. Vol. 1, Pt. 1, Motorcycle Safety, Washington, D. C., 1973

Motorcycle handling, Vehicle dynamics, Motorcycle stability, Steering, Tire moments, Tire side forces, Sideslip, Tire slip motion, Roll, Yaw, Camber, Vehicle mass, Coulomb friction, Stiffness, Damping, Loading (mechanical), Oscillation, Wheel wobble, Weaving, Moments of inertia, Computerized simulation, Equations of motion

Motorcycle differential equations of motion have been compared to experimental results obtained with an instrumented motorcycle. The equations are realistic with respect to the weave and capsize modes of motion, except at speeds of about 10 mph. These equations are not useful in describing steering wobble below about 35 mph. In actual tests, it was impossible to locate a speed range of complete stability or in which weave mode damping was near zero. The equations of motion, however, predict the existence of such speed ranges at about 15 mph. Tire overturning moments and aligning torques due to tire inclination tend to cancel each other if both are included in the tire model. It was determined that the viscous damper does not decrease roll stability, while the coulomb friction damper does. Also, coulomb friction damper effectiveness is dependent upon the magnitude of the steering disturbance, and viscous damper effectiveness is not.

HS-013 653

**5D. Design****A STATISTICAL DESCRIPTION OF LARGE AND SMALL CAR INVOLVEMENT IN ACCIDENTS**

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.

For primary bibliographic entry see Fld. 1B.

HS-013 606

**REPORTS ON TRAFFIC ACCIDENT RESEARCH, VOLVO, MARCH 1973****66P 2REFS**

Reference copy only

Accident research, Restraint system usage, Restraint system effectiveness, Three point restraint systems, Fatality causes, Volvos, Sweden, Data acquisition, Automobile repair costs, Damage severity index, Head restraints, Injury severity, Impact angle, Ejection, Accident analysis, Urban areas, Injury prevention, Injury severity index, Rural areas, Accident severity, Deformation analysis, Accident case reports, Accident types, Experimental automobiles, Safety cars, Crashworthiness

Volvo accidents for 1972 in Sweden are analyzed with reference to three point restraint system and seat belt effectiveness and crashworthiness of the Volvo Experimental Safety Car (VESC). Fatal accidents involving Volvo models 142, 144, 145, and 164 during 1972 were also analyzed to determine fatality causes and methods of fatality prevention. It was concluded that front seat belt usage has increased since 1967; the mean injury-reducing effect of seat belts for drivers and front seat passengers was 32% and 36%, respectively; head restraints in the front seats reduced neck injuries by approximately 55%, and

compliance with the VESC crashworthiness specification would have had some positive effect.  
HS-013 622

**BASIC RESEARCH IN CRASHWORTHINESS  
2--INCORPORATION OF A MODIFIED FRONT  
STRUCTURE INTO OPERATIONAL AUTOMOBILES.  
INTERIM TECHNICAL REPORT**

Calspan Corp., Buffalo, N. Y.  
P. M. Miller 1973 224p 7refs Rept. No. YB-2987-V-19  
Contract FH-11-7622  
NTIS

Automobile modification, Energy absorbing front structures, Crashworthiness, Automobile handling, Engine deflection, Barrier collision tests, Pole impact tests, Impact velocity, Fords, Passenger compartments, Head on impact tests, High speed impact tests, Kinematics, Severity indexes, Acceleration response, Dummies, Displacement, Bumper design, Body design, Fire walls, Vehicle weight, Performance tests, Cornering, Steering, Test equipment, Steady state, Lateral acceleration

A front structural modification utilizing the engine deflection concept developed on another phase of the Basic Research in Crashworthiness 2 project was refined and incorporated into a series of fully operational automobiles. The structure was adapted to conventional 1972 full size Ford sedans. The structural modification did not have a significant effect on the handling characteristics of the modified automobile when compared to similar data for the conventional automobile. Three different operational automobiles were developed and impact tested into both flat and pole barriers at speeds ranging from 40 mph to just under 60 mph. In addition, to provide comparative data, a conventional 1972 Ford was impacted into the pole at 57.8 mph. Results of the study demonstrate the feasibility of significantly improving front structural crash performance using conventional automotive technology.  
HS-800 874

**BASIC RESEARCH IN CRASHWORTHINESS  
2--FRONTAL CAR IMPACT TESTS OF UNMODIFIED  
VEHICLES. INTERIM TECHNICAL REPORT**

165P Rept. No. YB-2987-V-8  
Contract FH-11-7622  
NTIS

Crashworthiness, Vehicle vehicle impact tests, Head on impact tests, Air bag restraint systems, Restraint system tests, Vehicle size, Vehicle weight, Structural deformation analysis, Crush distance, Buicks, Fords, Acceleration response, Deceleration, Head acceleration tolerances, Chest acceleration tolerances, Displacement, Chevrolet Nova, Chevrolet Vega

Results of four vehicle vehicle head on impact tests are presented. The four tests involved a Ford sedan impacting a Ford, Buick, Chevrolet Nova, and a Chevrolet Vega, respectively. All four tests were conducted using unmodified vehicles impacting at a nominal 40 mph for each vehicle. Results obtained from piggyback air cushion tests are also included for the Ford/Buick, Ford/Nova, and Ford/Vega tests. It is emphasized here that these installations were state-of-the-art systems fitted to compartment geometry not optimum for the particular design. Hence, the results should be interpreted as baseline data only -- and not as performance data.  
HS-800 875

**BASIC RESEARCH IN CRASHWORTHINESS  
2--LARGE DEFLECTION COMPUTERIZED  
ANALYSIS OF RATE SENSITIVE ELASTO-PLASTIC  
FRAME STRUCTURES. INTERIM TECHNICAL  
REPORT**

Calspan Corp., Buffalo, N. Y.  
R. Shieh 1973 320p 29refs Rept. No. YB-2987-V-11  
Contract FH-11-7622  
NTIS

Crashworthiness, Dynamic structural analysis, Crash response forecasting, Energy absorbing frames, Computerized simulation, Structural deformation analysis, Deflection, Plasticity, Computer programs, Stiffness, Kinematics, Strain rate, Mechanics (physics), Mathematical analysis, Elasticity, Algorithms, Stress strain characteristics, Loading (mechanical), Force, Equations of motion, Collision models, Flow charts

A general computerized study, including the effects of axial forces and material strain rate sensitivity on the dynamic plastic behavior, for collapsing plane frame structures involving large deflections is presented within the context of elementary beam theory. The nonlinear initial value problem is formulated through use of the matrix displacement method of rigid frame analysis, and a computational algorithm based on the Runge-Kutta step by step integration and linear interpolation techniques for finding a special event (plastic loading or unloading initiation) time is developed. A computer program is developed for the special case of non-interaction between the axial force and bending moment at a beam cross section. Three example problems of which one is related to automobile crashworthiness of a special automobile front structure are presented.  
HS-800 884

**CRASH INJURY REDUCTION AND POST-CRASH  
FACTORS EVALUATIONS--GM-09 ESV--FIFTY MPH  
FRONTAL FLAT-BARRIER IMPACT. FINAL REPORT**

129P Rept. No. 2300-73-30  
Contract DOT-HS-046-2-468  
NTIS

Experimental automobiles, Safety cars, Barrier collision tests, Occupant protection, Crashworthiness, Postcrash phase, Low speed impact tests, Bumper tests, Acceleration response, Structural deformation analysis, Damage, Crush distance, Collapse, Air bag restraint systems, Chest acceleration tolerances, Pelvic acceleration tolerances, Head acceleration tolerances, Anthropomorphic dummies, Test equipment, Data acquisition, Occupant kinematics, Acceleration, General Motors Corp., High speed impact tests

The test procedures and results of front and rear low speed, no damage bumper tests and a 50 mph frontal flat barrier test with a General Motors (GM) Experimental Safety Vehicle (ESV) are presented. The primary objectives of the test series were to determine the occupant and structural responses of the GM ESV design when subjected to a 50 mph barrier impact. The front and the rear bumper systems functioned as designed. The 4.2 in. occupant compartment intrusion exceeded the design requirement of 3 in. maximum. An unanticipated weld failure at the inner frame rail in the front torque box probably contributed to the additional intrusion. Injury criteria were generally exceeded by all the dummies. However, the right front passenger did meet the head performance criteria. There was no spillage from or damage to the fuel system and doors required only minor effort before they could be opened.

## Group 5D—Design

HS-800 893

**SUMMARY OF GENERAL MOTORS  
EXPERIMENTAL SAFETY VEHICLE TESTS. FINAL  
REPORT**

38P Rept. No. 2310-73-43  
Contract DOT-HS-046-2-468  
Report for Jul-Dec 1972.  
NTIS

Experimental automobiles, Safety cars, General Motors Corp., Performance tests, Brake tests, Steering tests, Engine tests, Vehicle characteristics, Side impact tests, Bumper tests, Barrier collision tests, High speed impact tests, Low speed impact tests, Vehicle vehicle impact tests, Brake performance, Vehicle handling, Visibility, Vehicle performance, Crashworthiness, Acceleration response, Crush distance

The results of testing four General Motors (GM) Experimental Safety Vehicles (ESVs) are summarized. Two of the vehicles (GM-08 and GM-09) were fully functional and were utilized in all phases of the test program. The other two vehicles (GM-06 and GM-07) had previously been crash tested by GM during the development program and were suitably refurbished for further crash testing. The purpose of the test program was to conduct quantitative nondestructive and crash tests on the ESVs to determine their compliance with the Government performance specifications. The overall evaluation of the GM vehicles involved evaluation of design requirements, accident avoidance evaluations, crash injury reduction evaluations, and postcrash factors evaluations.

HS-800 909

**CRASH INJURY REDUCTION AND POST-CRASH  
FACTORS EVALUATIONS--GM-08 AND GM-09  
ESVS--SIXTY-MPH FRONT-TO-REAR IMPACT.  
FINAL REPORT**

130P Rept. No. 2310-73-40  
Contract DOT-HS-046-2-468  
Rept. for Dec 1972.  
NTIS

Experimental automobiles, Safety cars, Vehicle vehicle impact tests, Rear end impact tests, Crashworthiness, Occupant protection, General Motors Corp., Postcrash phase, Deformation, Crush distance, Acceleration response, Anthropomorphic dummies, Test equipment, Data acquisition, Data reduction, Head acceleration tolerances, Chest acceleration tolerances, Vehicle kinematics, Occupant kinematics, High speed impact tests

Results of a 60 mph front-to-rear crash test between two General Motors Experimental Safety Vehicles are presented. Primary objectives of the test reported were to determine the occupant and structural responses of the striking vehicle and to acquire limited data on the responses of the struck vehicle. A postcrash factors evaluation was also performed on the striking vehicle to evaluate fire hazard, rescue, and emergency egress.

HS-800 910

**DEVELOPMENT OF COMPLIANCE TEST  
PROCEDURES FOR FEDERAL MOTOR VEHICLE  
SAFETY STANDARD 215--EXTERIOR  
PROTECTION--PASSENGER CARS. FINAL REPORT**

Calspan Corp., Buffalo, N. Y.  
For primary bibliographic entry see Fld. 5Q.  
HS-800 918

## 5F. Fuel Systems

**CAN DIESELS MEET 1975 CALIFORNIA EMISSIONS  
LIMITS?**

Automotive Engineering v80 n12 p27-30 (Dec 1972)  
C. J. Walder 1972  
Based on SAE-730214, 'Reduction of Emissions from Diesel Engines'.  
Automotive Engineering v80 n12 p27-30 (Dec 1972)

Diesel engine exhaust emissions, Exhaust emission tests, Injection timing, Engine modification, Combustion chamber design, Exhaust emission measurement, Exhaust emission control, Fuel consumption, Turbocharging, Hydrocarbons, Nitrogen oxides, Exhaust gas recirculation, Aftercoolers, Water injection, Fuel injection, Engine performance, Combustion chamber swirl

With a simple modification to the injection timing of a production diesel engine with a swirl chamber combustion system, 1975 California emission regulations can be met under both naturally aspirated and turbocharged conditions. These results are achieved without significant sacrifice of smoke-limited power. However, the measures required to generate low exhaust emissions in direct injection systems result in a loss of smoke-limited power and a depreciation in specific fuel consumption. The effectiveness of turbocharging, aftercooling, exhaust gas recirculation, water injection, and pilot injection in controlling diesel engine exhaust emissions is briefly discussed.

HS-013 620

**COST EFFECTIVENESS OF EMISSION CONTROL**

For primary bibliographic entry see Fld. 2G.  
HS-013 629

**INSPECTION AND MAINTENANCE FOR REDUCING  
AUTOMOBILE EMISSIONS. EFFECTIVENESS AND  
COST**

Journal of the Air Pollution Control Association v23 n4 p273-6 (Apr 1973)  
J. Horowitz 1973 9refs  
Journal of the Air Pollution Control Association v23 n4 p273-6

Exhaust emission control, Benefit cost analysis, Exhaust emission tests, Exhaust emission measurement, Vehicle maintenance, Vehicle inspection, Tuneup, Inspection costs, Maintenance costs, Time factors, Exhaust emission control costs, Catalytic converters, Exhaust emission control device maintenance, Hydrocarbons, Carbon monoxide

Four methods of inspection and/or maintenance for in-use vehicles--idle mode emission test, key mode emission test, engine parameter inspection and mandatory tuneup--that are potentially applicable to pre-1975 automobiles have been tested by the Environmental Protection Agency. The characteristics of these methods are described, the reduction in total automobile emissions that can be achieved through the use of these methods are estimated, and the associated costs are evaluated. The idle mode and key mode emission tests are the most cost effective procedures. Idle mode and key mode inspection/maintenance programs may achieve 8% and 10% reductions in total automobile hydrocarbon and carbon monoxide emissions respectively until 1980 and 2-3% reductions in 1985. Post-1974 automobiles present special inspection/maintenance problems due to the likely use of catalytic converters on these vehicles. Inspection/maintenance for these vehicles is also discussed.

HS-013 630

### THE EFFECTIVENESS AND COST OF RETROFIT FOR REDUCING AUTOMOBILE EMISSIONS

Journal of the Air Pollution Control Association v23 n5 p395-7, 418 (May 1973)  
J. Horowitz 1973 10refs  
Journal of the Air Pollution Control Association v23 n5 p395-7, 418 (May 1973)

Retrofitting, Exhaust emission control costs, Benefit cost analysis, Catalytic converters, Exhaust gas recirculation, Manifold air injection systems, Air fuel ratio, Vehicle inspection, Vehicle maintenance, Hydrocarbons, Nitrogen oxides, Carbon monoxide, Exhaust emission measurement, Exhaust emission control, Maintenance costs

The Environmental Protection Agency has recently evaluated several automobile retrofit systems that are potentially applicable to pre-1975 vehicles. These systems included an air bleed to intake manifold; a catalytic converter with a vacuum advance disconnect; speed-controlled exhaust gas recirculation with a distributor vacuum advance disconnect; and the GM System in which the idle air fuel mixture is made leaner than normal, idle speed is increased, and the vacuum timing advance is made inoperative during normal engine operation. It is estimated that retrofit combined with inspection/maintenance can potentially achieve reductions in automobile emissions of 33% to 60% in 1975, depending on pollutant, and 10% to 20% in 1985. The estimated present value discounted to 1972 of the average cost per retrofit vehicle is —30 to —152 over the period 1975-1985 depending on the retrofit system used. The corresponding annualized cost is —6 to —28 per vehicle.

HS-013 631

### 5I. Inspections

### THE EFFECTIVENESS AND COST OF RETROFIT FOR REDUCING AUTOMOBILE EMISSIONS

For primary bibliographic entry see Fld. 5F.  
HS-013 631

### 5K. Maintenance And Repairs

### THE 1000 CAR FIELD TRIAL PROGRAM

General Motors Corp., Warren, Mich. Environmental Activities Staff  
For primary bibliographic entry see Fld. 5N.  
HS-013 612

### INSPECTION AND MAINTENANCE FOR REDUCING AUTOMOBILE EMISSIONS. EFFECTIVENESS AND COST

For primary bibliographic entry see Fld. 5F.  
HS-013 630

### THE EFFECTIVENESS AND COST OF RETROFIT FOR REDUCING AUTOMOBILE EMISSIONS

For primary bibliographic entry see Fld. 5F.  
HS-013 631

### 5N. Occupant Protection

### RESTRAINT SYSTEM EFFECTIVENESS-A STUDY OF FATAL ACCIDENTS

General Motors Corp., Warren Mich. Environmental Activities Staff

R. A. Wilson, C. M. Savage 1973 69p

Presented at General Motors Automotive Safety Seminar, Warren, 20-21 Jun 1973.  
Corporate author

Restraint system effectiveness, Fatality prevention, Accident analysis, Seat belts, Three point restraint systems, Air bag restraint systems, Accident case reports, Impact protection, Occupant protection, Front end collisions, Side impact collisions, Rollover accidents, Fatality causes, Fatalities by seat occupation, Rear end collisions

Accidents involving 706 fatally injured occupants in 1967 through 1972 cars were examined to assign the fatality reduction potential of a lap belt alone, a lap and shoulder belt, an air cushion alone, and an air cushion plus lap belt. If all the fatalities had been wearing a lap belt, 17% could have been saved. If all the fatalities had been wearing a lap and shoulder belt, 31% could have been saved. If all the cars had been equipped with air cushions, 18% of the fatalities could have been saved. If all the cars had been equipped with air cushions, and all the fatalities had been wearing a lap belt, 29% could have been saved. Projecting these results to the real world is influenced by current belt usage, belt usage incentive effects, air cushion introduction timetable effects, injury reduction, the possibility of restraint system caused injuries, and restraint system cost effectiveness.

HS-013 604

### RESTRAINT OF CHILDREN

General Motors Corp., Warren, Mich. Environmental Activities Staff

W. B. McCormick, S. L. Schmelter, R. B. Heintz 1973 15p 8refs  
Presented at General Motors Automotive Safety Seminar, Warren, 20-21 Jun 1973.  
Corporate author

Biomechanics, Infant restraint systems, Child safety seats, Restraint system design, Restraint system tests, Three point restraint systems, Dummies, Occupant kinematics, Barrier collision tests, Accident studies, Seat belt caused injuries, Restraint system effectiveness, Air bag restraint systems, General Motors Corp.

The General Motors Infant Love Seat provides improved restraint for infants of up to 20 lbs who cannot sit up alone. The Child Love Seat is designed for use by children who weigh between 20 and 40 lbs, whose height is 40 inches or less, and who can sit upright alone. A vehicle's adult belt system can be used by children who are able to sit up alone. Use of the belt system will restrain the child during an accident. The shoulder belt can be worn to provide added upper torso restraint. Face and neck irritation can be minimized by repositioning the child on the vehicle seat, and/or proper use of the comfort clip. If irritation cannot be relieved, the child can be lap belted in the rear seat. Studies concerning child restraint are limited by the lack of biomechanical and field data about children's impact tolerances.

HS-013 605

### BENEFIT STUDY OF EIGHT VEHICLE OCCUPANT RESTRAINT CONFIGURATIONS

General Motors Corp., Warren, Mich. Environmental Activities Staff

J. W. Scheel 1973 12p 5refs

Presented at General Motors Automotive Safety Seminar, Warren, 20-21 Jun 1973.  
Corporate author

**Group 5N—Occupant Protection**

Restraint system effectiveness, Fatality prevention, Injury prevention, Restraint system usage, Three point restraint systems, Air bag restraint systems, Seat belts, Ignition restraint system interlocks, Seat belt fastening warning systems, Seat belt usage laws, Accident studies

The effectiveness of a 1973 type seat and detachable shoulder belt configuration, a 1974 type (including ignition interlock), a 1974 type without interlock but with a seat belt usage law, a front seat air cushion restraint system (ACRS) plus three rear seat belts, a front seat ACRS plus six seat belts, a front seat ACRS plus six seat belts and a seat belt fastening warning system, a front and rear ACRS, and a front and rear ACRS plus six seat belts are compared by examining accident study results. Front seat air bags with seat belts for all occupants and some device to encourage seat belt usage would provide the greatest fatality and injury reductions. A seat belt usage law would yield more immediate benefits than new configurations. Three point restraint systems can provide immediate benefits, while air bags with seat belts require less coercion and may have a better long-term payoff.

HS-013 609

**DEVELOPMENT OF THE GM CHILD LOVE SEAT**

General Motors Corp., Warren, Mich. Fisher Body Div.  
N. Feles, L. P. Garvey, J. P. Makinen 1973 13p 2refs  
Presented at General Motors Automotive Safety Seminar, Warren, 20-21 Jun 1973.  
Corporate author

Child safety seats, Seat design, Restraint system design, Harnesses, Seat belts, Head restraints, Padding, Seat standards, Barrier collision tests, Impact sleds, Restraint system tests, Occupant protection, General Motors Corp., Loading (mechanical)

General Motors recently developed a forward facing padded child safety seat with a five point restraint harness and an upper tie down strap to minimize forward excursions of the head by limiting seat movement. The child seat cushion sides were designed far enough forward to minimize contact of the abdominal area of the child and the vehicle seat belt. Dynamic performance objectives included structural integrity of the seat and minimal excursion of the child in both 30 mph frontal barrier impacts and 20 mph moving side barrier impacts. The seat is recommended for children who weigh from 20 to 40 lbs and who are 40 inches or less in height and can be utilized in automobiles manufactured in the United States since 1968, which are equipped with rear seats and in which the child seat can be secured with both the vehicle lap belt and the upper tie down strap.

HS-013 610

**RESTRAINT SYSTEM CHOICES--SHOULD THE CUSTOMER DECIDE?**

General Motors Corp., Warren, Mich. Environmental Activities Staff  
D. E. Martin, A. J. Yanik 1973 7p  
Presented at General Motors Automotive Safety Seminar, Warren, 20-21 Jun 1973.  
Corporate author

Air bag restraint systems, Seat belts, Ignition seat belt interlocks, Three point restraint systems, Restraint system effectiveness, Occupant protection, Injury prevention, Fatality prevention

Three options for fulfilling 1974 occupant protection requirements include a front seat air bag restraint system, air bags plus seat belts, and seat belts with an ignition interlock. The air bag restraint system is the most convenient, and if all cars were equipped with front seat air bags, a potential 18% fatality reduction and a 20% injury reduction could be realized on a national scale. Air bags plus seat belts could provide the individual with about the same level of protection in a serious accident as three point restraint systems (about 29%) but without the physical restrictions of the shoulder belt. The ignition seat belt interlock is the most protective and least expensive system. A 13% fatality reduction and a 25% injury reduction could be realized on a national level. The offering of three different restraint applications would take into account the diversities of human nature as well as economics.

HS-013 611

**THE 1000 CAR FIELD TRIAL PROGRAM**

General Motors Corp., Warren, Mich. Environmental Activities Staff  
G. R. Smith, M. R. Bennett 1973 21p  
Presented at General Motors Automotive Safety Seminar, Warren, 20-21 Jun 1973.  
Corporate author

Restraint system tests, Air bag restraint systems, Field tests, Restraint system design, Barrier collision tests, Restraint system effectiveness, Impact angle, Accident analysis, Front end impact tests, Side impact tests, Impact velocity, Vehicle vehicle collisions, Vehicle fixed object collisions, Automobile repair, Defect correction

As of June 11, 1973, a fleet of 100 Chevrolet Impalas equipped with front seat air bag restraint systems have accumulated 101 accidents and 8.1 million miles of operation. There have been three accidents severe enough to cause deployment of the air bags, and case reports are presented. One inadvertent deployment of an air bag has occurred but the cause is still undetermined. Only the passenger side subsystem deployed, and the woman passenger suffered a dislocated, possibly fractured, left thumb and some bruises on the left upper chest. Examples of accidents not severe enough for air bag deployment are presented. A service team for the fleet vehicles is available 24 hours a day. The primary malfunction has been faulty warning lights. Results of impact tests involving the air bag restraint system are presented.

HS-013 612

**IN DEPTH STUDY OF SEAT BELTED ACCIDENTS**

Monash Univ., Clayton, Vic. (Australia)  
G. A. Ryan, R. J. Baldwin 1972 49p 5refs Rept. No. Ref-71/1276  
Sponsored by Australia Dept. of Shipping and Transport.  
Corporate author

Restraint system effectiveness, Three point restraint systems, Seat belt usage, Accident analysis, Injury severity, Seat belt caused injuries, Restraint system failures, Seat belt positioning, Shoulder harness positioning, Police reports, Accident case reports, Impact angle, Sex factors, Age factors, Side impact collisions, Seat belt slack, Webbing, Restraint system assembly anchorages, Seat belt installation, Measuring instruments

Examinations of 60 persons involved in 46 accidents were conducted. It was found that police reports underestimated seat belt usage by up to 20%. Of the 36 persons known to have been wearing three point restraint systems, eight received fatal inju-

ries, 13 severe or very severe injuries, and 15 lesser injuries. Eleven persons received seat belt caused injuries, of whom seven suffered minor abrasions and bruises and four severe internal abdominal and skeletal injuries. The excessive number of side impacts suggested that impacts from the opposite side of the car are more injurious than impacts on the same side. Crash-involved occupants had restraint systems adjusted with the upper and lower loops much looser than the optimum, and wore the buckle much farther forward on the body. The mechanical performance of the three point restraint system was satisfactory, but over half (54%) of the 54 restraint systems examined were faulty.

HS-013 613

#### **ROAD ACCIDENT INVESTIGATION. ACCIDENTS IN SWEDEN WITH SAAB 99, REPORT FROM FIRST PHASE**

Uddevalla Central Hosp. (Sweden); Saab-Scania A.B., Sodertalje (Sweden)

For primary bibliographic entry see Fld. 1E.

HS-013 621

#### **A PRELIMINARY ANALYSIS OF SAFETY HELMET EFFECTIVENESS**

National Hwy. Traf. Safety Administration, Washington, D.C.

For primary bibliographic entry see Fld. 3C.

HS-013 646

#### **THE ROLE OF HELMETS IN MOTORCYCLE ACCIDENTS**

Tokyo Jikeikai Univ. (Japan)

For primary bibliographic entry see Fld. 3C.

HS-013 647

#### **DEVELOPMENTS IN MOTORCYCLE HELMET TESTING AND THEIR EFFECTS ON FUTURE DESIGNS**

Brown (Dayton T.), Inc., Bohemia, N. Y.

For primary bibliographic entry see Fld. 3C.

HS-013 648

#### **BASIC RESEARCH IN CRASHWORTHINESS 2--FRONTAL CAR IMPACT TESTS OF UNMODIFIED VEHICLES. INTERIM TECHNICAL REPORT**

165P Rept. No. YB-2987-V-8

Contract FH-11-7622

NTIS

Crashworthiness, Vehicle vehicle impact tests, Head on impact tests, Air bag restraint systems, Restraint system tests, Vehicle size, Vehicle weight, Structural deformation analysis, Crush distance, Buicks, Fords, Acceleration response, Deceleration, Head acceleration tolerances, Chest acceleration tolerances, Displacement, Chevrolet Nova, Chevrolet Vega

Results of four vehicle vehicle head on impact tests are presented. The four tests involved a Ford sedan impacting a Ford, Buick, Chevrolet Nova, and a Chevrolet Vega, respectively. All four tests were conducted using unmodified vehicles impacting at a nominal 40 mph for each vehicle. Results obtained from piggyback air cushion tests are also included for the Ford/Buick, Ford/Nova, and Ford/Vega tests. It is emphasized here that these installations were state-of-the-art systems fitted

to compartment geometry not optimum for the particular design. Hence, the results should be interpreted as baseline data only -- and not as performance data.

HS-800 875

#### **CRASH INJURY REDUCTION AND POST-CRASH FACTORS EVALUATIONS--GM-09 ESV--FIFTY MPH FRONTAL FLAT-BARRIER IMPACT. FINAL REPORT 129P Rept. No. 2300-73-30**

Contract DOT-HS-046-2-468

NTIS

Experimental automobiles, Safety cars, Barrier collision tests, Occupant protection, Crashworthiness, Postcrash phase, Low speed impact tests, Bumper tests, Acceleration response, Structural deformation analysis, Damage, Crush distance, Collapse, Air bag restraint systems, Chest acceleration tolerances, Pelvic acceleration tolerances, Head acceleration tolerances, Anthropomorphic dummies, Test equipment, Data acquisition, Occupant kinematics, Acceleration, General Motors Corp., High speed impact tests

The test procedures and results of front and rear low speed, no damage bumper tests and a 50 mph frontal flat barrier test with a General Motors (GM) Experimental Safety Vehicle (ESV) are presented. The primary objectives of the test series were to determine the occupant and structural responses of the GM ESV design when subjected to a 50 mph barrier impact. The front and the rear bumper systems functioned as designed. The 4.2 in. occupant compartment intrusion exceeded the design requirement of 3 in. maximum. An unanticipated weld failure at the inner frame rail in the front torque box probably contributed to the additional intrusion. Injury criteria were generally exceeded by all the dummies. However, the right front passenger did meet the head performance criteria. There was no spillage from or damage to the fuel system and doors required only minor effort before they could be opened.

HS-800 893

#### **5P. Registration**

#### **DESIGN MANUAL FOR STATE TRAFFIC RECORDS SYSTEMS. VOL. 2, STANDARD DATA ELEMENTS AND CODING. SECT. 2, VEHICLE DATA SUBSYSTEM**

81P

GPO

Information system design, Computerized records management, Coding systems, Data processing, Automatic vehicle identification, Vehicle registration, Traffic records, State planning, Manuals

The Vehicle Data Subsystem of the State Traffic Records System is designed to support State functions related to the registration of motor vehicles; provide for collection and maintenance of data related to the mechanical condition of vehicles registered in the State; provide for collection and maintenance of history records related to the theft and abandonment of motor vehicles; and support State administrative functions related to titling and lien laws for vehicular property. The subsystem consists of a vehicle identification directory file, a registration data file, a vehicle history file, a stolen, abandoned, and lost property data file, and a titling and financial data file.

## Group 5P—Registration

The data contents of the subsystem files are summarized and detailed recommended coding formats and codes for the data elements contained in the subsystem files are described.  
HS-820 272

## 5Q. Safety Defect Control

**REPORT TO THE CONGRESS. FOR SAFER MOTOR VEHICLES--MORE EFFECTIVE EFFORTS NEEDED TO INSURE COMPLIANCE WITH FEDERAL SAFETY STANDARDS**

66P Rept. No. B-164497(3)

Includes 'Department of Transportation Statement on GAO Report', by J. E. Wilson.  
Corporate author —1.00

Safety standards compliance, Vehicle safety standards, Compliance tests, Recall campaigns, Federal control, Accident investigation, Defective vehicles, Multidisciplinary teams, Tire tests, Manufacturers liability, Defect correction, Accident analysis, Accident causes, Failures, National Hwy. Traf. Safety Administration

The National Highway Traffic Safety Administration (NHTSA) compliance testing has resulted in recalls involving about 105,000 domestic and 140,000 foreign vehicles. Vehicle and equipment performance in accidents should be a major factor in selecting vehicle models and equipment for testing and in assigning testing priorities. Thirty-four safety standards were effective on or before September 1, 1972. However, over half the funds obligated from compliance testing in the past three years was used for testing manufacturers' compliance with two tire safety standards. Less than a third was used for compliance testing of total vehicle performance. More effective use of manufacturers' certification data to supplement and refine NHTSA tests is needed. NHTSA should review manufacturers' certification data for indications of safety standards misinterpretation, faulty test procedures, inadequate testing, and failure to follow up on test failures and to assure continuing standards compliance. More timely action is needed to resolve test failures and correct defects.

HS-013 615

**DEVELOPMENT OF COMPLIANCE TEST PROCEDURES FOR FEDERAL MOTOR VEHICLE SAFETY STANDARD 215--EXTERIOR PROTECTION--PASSENGER CARS. FINAL REPORT**

Calspan Corp., Buffalo, N. Y.

R. H. Arendt, R. J. Cassidy, D. T. Kunkel 1973 27p Rept. No. ZP-5353-K-1

Contract DOT-HS-053-3-768

Report for 28 Jun-30 Jul 1973.

NTIS

Safety standards compliance, Compliance tests, Vehicle safety standards, Pendulum tests, Pendulums, Stiffness, Bending, Loads (forces), Twisting, Test equipment, Torsion, Bumper tests, Impact angle, High speed photography, Energy absorbing bumpers, Deflection, Impact velocity, Mathematical analysis

The primary purpose of this program was to investigate the lateral and torsional stiffness characteristics of the Calspan Corporation Pendulum Test Device (PTD), to modify the PTD to increase both the lateral and torsional stiffness, and to recommend criteria for specifying minimum transverse bend-

ing, minimum torsional stiffness, and other properties relevant to the unambiguous specification of pendulum performance. The static stiffness measurements were made before and after pendulum modification. Several pendulum impact tests were performed before and after pendulum modification on a 1973 Ford Galaxie bumper guard with various degrees of pendulum bumper guard centerline offset. The bumper impact tests were documented on high speed film.

HS-800 918

## 5R. Steering Control Systems

**HIGHWAY ACCIDENT REPORT. PROPANE TRACTOR-SEMITRAILER OVERTURN AND FIRE, U.S. ROUTE 501, LYNCHBURG, VIRGINIA, MARCH 9, 1972**

29P 12REFS Rept. No. NTSB-HAR-73-3, 55-H-21

Contains Highway Safety Recommendations H-73-20 through H-73-29.

Corporate author

Truck overturn accidents, Accident case reports, Tractor semitrailers, Accident caused fires, Driver error caused accidents, Tank trucks, Propane, Accident causes, Burns, Fatality causes, Injury causes, Wrong way driving, Truck center of gravity, Accident location, Vehicle fixed object collisions, Vehicle characteristics, Property damage accidents, Driver emergency responses, Accident prevention, Transportation of hazardous materials, Driver licensing, Driver records, Warning signs, Accident analysis, Damage severity, Road grades, Road curves, Truck stability, Traffic signs, Centerline markings, Ruptures, Vehicle design, Lynchburg, Driver characteristics, Vehicle dynamics

A tractor semitrailer (tank) carrying pressurized liquid propane overturned at 2:30 p.m. After overturning, the vehicle slid on its side and struck a rock embankment, which ruptured the tank shell and permitted the propane to escape. When the propane-air mixture ignited, two persons, including the truck driver, were killed, and five others were injured. The cause of the overturn was the driving of the tractor semitrailer on the wrong side of the road, and a subsequent evasive steering action which exceeded the limited capability of the truck to resist overturn. Contributing factors included a misleading traffic sign, an inadequate centerline marking, and the high center of gravity of the truck. The causes of the burn fatalities and injuries were rupture of the tank at a point susceptible to rupture and the inadequacy of the required placards as a means of warning bystanders of the nature and range of the hazard.

HS-013 627

**FACTORS AFFECTING VEHICLE SKIDS: A BASIS FOR WET WEATHER SPEED ZONING. INTERIM REPORT**

Texas A and M Univ., College Station. Texas Transp. Inst.

For primary bibliographic entry see Fld. 2D.

HS-013 635

**INTERNATIONAL CONGRESS ON AUTOMOTIVE SAFETY (2ND) PROCEEDINGS, SAN FRANCISCO, JULY 16-18, 1973. VOL. 1, PT. 1, MOTORCYCLE SAFETY**

308P 90REFS

Includes HS-013 639--HS-013 653.

Corporate author

Motorcycle safety, Motorcycle operators, Motorcycle accidents, Motorcycle handling, Helmets, Accident prevention, Age factor in accidents, Accident causes, Motorcycle operator education, Accident analysis, Accident statistics, Motorcycle riding techniques, Motorcycle operator fatalities, Motorcycle operator injuries, Motorcycle passenger fatalities, Motorcycle passenger injuries, Defensive driving, High school driving courses, Impact tests, Helmet design, Motorcycle design, Motorcycle restraint systems, Vehicle stability, Computerized simulation, Vehicle dynamics, Injury prevention

Because of the increasing popularity of motorcycles both for basic transportation and recreational activities, a conference of industry and government leaders was held to discuss aspects of motorcycle safety including motorcycle accident statistics, causes, characteristics, and age factor in accidents; motorcycle operation education; helmet design and the effectiveness of helmets and other protective clothing in accidents; and motorcycle stability and handling.

HS-013 638

**A MANUAL CONTROL VIEW OF MOTORCYCLE HANDLING**

Systems Technology, Inc., Hawthorne, Calif.  
For primary bibliographic entry see Fld. 5C.  
HS-013 650

**THE STEADY STATE AND TRANSIENT HANDLING CHARACTERISTICS OF A MOTORCYCLE**

Cranfield Inst. of Tech., Beds. (England)  
For primary bibliographic entry see Fld. 5C.  
HS-013 651

**SIMULATION STUDY OF MOTORCYCLE STABILITY AT HIGH SPEED**

Calspan Corp., Buffalo, N. Y.  
For primary bibliographic entry see Fld. 5C.  
HS-013 652

**LATERAL DYNAMICS OF THE UNCONTROLLED MOTORCYCLE**

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.  
For primary bibliographic entry see Fld. 5C.  
HS-013 653

**STABILITY AND HANDLING CRITERIA OF ARTICULATED VEHICLES, SUMMARY. FINAL REPORT**

IIT Res. Inst., Chicago, Ill.  
R. L. Eshleman, S. D. Desai, A. F. D'Souza 1973 40p 2refs  
Rept. No. J6281  
Contract DOT-HS-105-2-392  
Report for Jun 1972-Jun 1973.  
NTIS

Tractor semitrailers, Vehicle stability, Vehicle handling, Computerized simulation, Simulation models, Mathematical models, Performance tests, Cornering, Lane changing, Accident avoidance, Yaw, Roll, Pitch, Lateral acceleration, Steering, Loading (mechanical), Wet road conditions, Dry road conditions, Braking, Tire side forces, Tire pavement interface, Coefficient of friction

An analytical and experimental investigation on the stability and handling of articulated vehicles was conducted to develop stability criteria for tractor single-, double-, and triple-semitrailer vehicles during commonly encountered road and speed maneuvers, such as cornering, lane changing, and evasive maneuvers, subject to environmental influences. To this end, an experimentally validated digital simulation model, the Articulated Vehicle Dynamic Simulation Model (AVDS3), was further developed and validated. It was utilized to generate physical stability limits for articulated vehicles. During this investigation, the direct method of Lyapunov was employed to generate mathematical stability limits of cornering articulated vehicles. In addition, an effort was made to apply the concept of finite time stability to this problem.  
HS-800 914

**STABILITY AND HANDLING CRITERIA OF ARTICULATED VEHICLES, PT. 2, AVDS3 USER'S MANUAL. FINAL REPORT**

IIT Res. Inst., Chicago, Ill.  
R. L. Eshleman, S. D. Desai, A. F. D'Souza 1973 137p refs  
Rept. No. J6281-Pt-2  
Contract DOT-HS-105-2-392  
Report for Jun 1972-Jun 1973.  
NTIS

Tractor semitrailers, Vehicle stability, Vehicle handling, Computerized simulation, Simulation models, Instruction manuals, Flow charts, Computer programs, Vehicle size

The Articulated Vehicle Dynamic Simulation Model (AVDS3) mathematically simulates the dynamic response of tractor single-, double-, and triple-semitrailer vehicles using a digital computer. The computer code is experimentally verified, modularly constructed, and centrally controlled. The dynamic characteristics of the vehicle system subject to road, vehicle, and environmental factors can be evaluated with the AVDS3 model which computes the steering and braking demands for the specified vehicle while negotiating a prescribed trajectory. AVDS3 performs a time dependent simulation of the vehicle's motions along with checks on physical stability and mathematical stability (tractor semitrailer only). Flow diagrams, the complete computer program, the arrangement of the data cards for an AVDS3 simulation, specific information on entering data on these cards, and the computer input/output data for a simulation of a tractor triple-semitrailer making a cornering maneuver are included.  
HS-800 916

**5T. Trucks And Trailers**

**HIGHWAY ACCIDENT REPORT. PROPANE TRACTOR-SEMITRAILER OVERTURN AND FIRE, U.S. ROUTE 501, LYNCHBURG, VIRGINIA, MARCH 9, 1972**

29P 12REFS Rept. No. NTSB-HAR-73-3, 55-H-21

Contains Highway Safety Recommendations H-73-20 through H-73-29.

Corporate author

Truck overturn accidents, Accident case reports, Tractor semitrailers, Accident caused fires, Driver error caused accidents, Tank trucks, Propane, Accident causes, Burns, Fatality causes, Injury causes, Wrong way driving, Truck center of



**Group 5T—Trucks And Trailers**

gravity, Accident location, Vehicle fixed object collisions, Vehicle characteristics, Property damage accidents, Driver emergency responses, Accident prevention, Transportation of hazardous materials, Driver licensing, Driver records, Warning signs, Accident analysis, Damage severity, Road grades, Road curves, Truck stability, Traffic signs, Centerline markings, Ruptures, Vehicle design, Lynchburg, Driver characteristics, Vehicle dynamics

A tractor semitrailer (tank) carrying pressurized liquid propane overturned at 2:30 p.m. After overturning, the vehicle slid on its side and struck a rock embankment, which ruptured the tank shell and permitted the propane to escape. When the propane-air mixture ignited, two persons, including the truck driver, were killed, and five others were injured. The cause of the overturn was the driving of the tractor semitrailer on the wrong side of the road, and a subsequent evasive steering action which exceeded the limited capability of the truck to resist overturn. Contributing factors included a misleading traffic sign, an inadequate centerline marking, and the high center of gravity of the truck. The causes of the burn fatalities and injuries were rupture of the tank at a point susceptible to rupture and the inadequacy of the required placards as a means of warning bystanders of the nature and range of the hazard.

HS-013 627

**STABILITY AND HANDLING CRITERIA OF  
ARTICULATED VEHICLES, SUMMARY. FINAL  
REPORT**

IIT Res. Inst., Chicago, Ill.

For primary bibliographic entry see Fld. 5R.

HS-800 914

**STABILITY AND HANDLING CRITERIA OF  
ARTICULATED VEHICLES, PT. 2, AVDS3 USER'S  
MANUAL. FINAL REPORT**

IIT Res. Inst., Chicago, Ill.

For primary bibliographic entry see Fld. 5R.

HS-800 916

**5V. Wheel Systems**

**GENERAL MOTORS TIRE IMPROVEMENT  
PROGRAM**

General Motors Proving Ground, Milford, Mich.

K. G. Peterson, F. D. Smithson 1973 7p

Presented at General Motors Automotive Safety Seminar, Warren, 20-21 Jun 1973.

Corporate author

Tire standards, Specifications, Tire design, Tire performance,

Tire characteristics, General Motors Corp.

General Motors Corp. and its tire suppliers have developed and tested a new common specifications tire, which has been introduced in limited quantities on 1973 models and is scheduled in significant quantities as both standard and optional equipment on 1974 models. Features of the new tire include steel-belted radial construction; closely controlled dimensions in the 78 series to provide the appearance of a low, wide tire while allowing adequate clearance and the standing height needed for proper bumper height; tread design with superior wet traction capability but without a significant increase in noise; improved snow driving traction and stopping distance in snow; a 60% tread wear life improvement; good handling and riding comfort; and up to a five per cent improvement in fuel economy.

HS-013 608

**VARIABLES ASSOCIATED WITH AUTOMOBILE  
TIRE HYDROPLANING**

Texas A and M Univ., College Station. Texas Transp. Inst.

A. J. Stocker, J. M. Lewis 1972 86p 52refs Rept. No.

TTI-2-8-70-147-2, RR-147-2, PB-219 258

Sponsored by Texas Hwy. Dept. in cooperation with the Federal Hwy. Administration.

NTIS

Hydroplaning, Tire pavement interface, Tire traction, Pavement surface texture, Tire inflation pressure, Tire tread depths, Water depth, Wet road conditions, Bias tires, Pavement skidding characteristics, Speed, Concrete pavements, Asphalt pavements, Bituminous concrete pavements, Tire loads, Speed limits, Spin control

The wet weather characteristics of four pavements—a portland cement concrete, a bituminous surface treatment, a hot mix asphalt, and a jennite surface—and several bias ply tires with different tread depths, a wide tire, and a test standard tire were studied. Wheel spin-down was used as the criterion and the variables considered were tire tread depth, tire inflation pressure, water depth, and wheel load. The results indicate that the bituminous surface treatment requires a considerably higher ground speed to cause spin-down than do the other pavements tested. It was also observed that no single critical speed, necessary for wheel spin-down to occur, exists for the range of variables selected, but it is recommended that there be a reduction of speed to 50 mph for any section of highway on which water can accumulate to 0.1 inch or more during wet weather periods.

HS-013 636

**THE STEADY STATE AND TRANSIENT HANDLING  
CHARACTERISTICS OF A MOTORCYCLE**

Cranfield Inst. of Tech., Beds. (England)

For primary bibliographic entry see Fld. 5C.

HS-013 651

## **REPORT NUMBER INDEX**

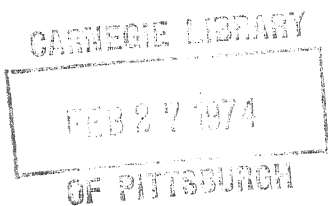
PB-220 321  
 HS-013 637  
 PB-220 367  
 HS-013 635  
 RR-147-2, " PB-219 258  
 HS-013 636  
 55-H-21  
 HS-013 627  
 APD-TECH-72-110-1  
 HS-013 614  
 B-164497(3)  
 HS-013 615  
 DOT-HS-034-2-409-73-1  
 HS-800 903  
 ED-73-9  
 HS-800 913  
 FR-1  
 HS-800 921  
 HS-013 604  
 HS-013 605  
 HS-013 606  
 HS-013 607  
 HS-013 608  
 HS-013 609  
 HS-013 610  
 HS-013 611  
 HS-013 612  
 HS-013 613  
 HS-013 614  
 HS-013 615  
 HS-013 616  
 HS-013 617  
 HS-013 618  
 HS-013 619  
 HS-013 620  
 HS-013 621  
 HS-013 622  
 HS-013 623  
 HS-013 624  
 HS-013 625  
 HS-013 626  
 HS-013 627  
 HS-013 628  
 HS-013 629  
 HS-013 630  
 HS-013 631  
 HS-013 632  
 HS-013 633  
 HS-013 634  
 HS-013 635  
 HS-013 636  
 HS-013 637  
 HS-013 638  
 HS-013 639  
 HS-013 640  
 HS-013 641  
 HS-013 642  
 HS-013 643  
 HS-013 644  
 HS-013 645  
 HS-013 646  
 HS-013 647  
 HS-013 648  
 HS-013 649  
 HS-013 650  
 HS-013 651  
 HS-013 652  
 HS-013 653  
 HS-800 720  
 HS-800 827  
 HS-800 828  
 HS-800 829  
 HS-800 874  
 HS-800 875  
 HS-800 876  
 HS-800 882  
 HS-800 884  
 HS-800 888  
 HS-800 893  
 HS-800 897  
 HS-800 903  
 HS-800 904  
 HS-800 909  
 HS-800 910  
 HS-800 913  
 HS-800 914  
 HS-800 916  
 HS-800 918  
 HS-800 920

2D  
 2D  
 5V  
 1C  
 2K  
 5Q  
 3A  
 3E  
 1C  
 5N  
 5N  
 1B  
 3A  
 5V  
 5N  
 5N  
 5N  
 5N  
 2K  
 5Q  
 2K  
 2K  
 1E  
 2K  
 5F  
 1E  
 1C  
 1C  
 2I  
 3A  
 3A  
 1C  
 3E  
 2G  
 5F  
 5F  
 2G  
 2D  
 1C  
 2D  
 5V  
 2D  
 5C  
 3C  
 1C  
 1E  
 3C  
 3E  
 3E  
 3E  
 3C  
 3C  
 3C  
 3N  
 5C  
 5C  
 5C  
 5C  
 2H  
 2H  
 2H  
 5D  
 5D  
 1C  
 3D  
 5D  
 3D  
 5D  
 1A  
 3A  
 3F  
 5D  
 5D  
 3E  
 5R  
 5R  
 5Q  
 1C

1C  
 3A  
 2K  
 2K  
 2K  
 2K  
 2K  
 2K  
 3K  
 J6281  
 HS-800 914  
 J6281-PT-2  
 HS-800 916  
 NTSB-HAR-73-3  
 HS-013 627  
 PAPER-73001  
 HS-013 639  
 PAPER-73003  
 HS-013 640  
 PAPER-73004  
 HS-013 641  
 PAPER-73005  
 HS-013 642  
 PAPER-73006  
 HS-013 643  
 PAPER-73007  
 HS-013 644  
 PAPER-73008  
 HS-013 645  
 PAPER-73013  
 HS-013 646  
 PAPER-73014  
 HS-013 647  
 PAPER-73015  
 HS-013 648  
 PAPER-73016  
 HS-013 649  
 PAPER-73018  
 HS-013 650  
 PAPER-73019  
 HS-013 651  
 PAPER-73020  
 HS-013 652  
 PAPER-73021  
 HS-013 653  
 REF-71/1276  
 HS-013 613  
 RP-7-FR  
 HS-013 637  
 RR-135-2F  
 HS-013 635  
 RR-7  
 HS-013 624  
 SRI-TN-1077-1  
 HS-013 617  
 SSDC-TR-72-371  
 HS-013 619  
 TTI-2-8-70-147-2  
 HS-013 636  
 USC-MR-5  
 HS-800 876  
 USC-73-PHASE-2-FINAL  
 HS-800 920  
 YB-2987-V-11  
 HS-800 884  
 YB-2987-V-19  
 HS-800 874  
 YB-2987-V-8  
 HS-800 875  
 ZP-5353-K-1  
 HS-800 918  
 15CONTRACT  
 HS-013 618  
 HS-013 623  
 HS-800 720  
 HS-800 827  
 HS-800 829  
 HS-800 882  
 HS-800 888  
 HS-800 897  
 HS-800 904  
 HS-800 925  
 2300-73-30  
 HS-800 893  
 2310-73-40  
 HS-800 910  
 2310-73-43  
 HS-800 909  
 1E  
 1C  
 2H  
 2H  
 2H  
 3D  
 3D  
 1A  
 3F  
 3A  
 5D  
 5D  
 5D  
 5D

**U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION**

Office of Administration  
WASHINGTON, D.C. 20590  
**OFFICIAL BUSINESS**  
Penalty For Private Use, \$300



**POSTAGE AND FEES PAID**  
NATIONAL HIGHWAY TRAFFIC SAFETY  
ADMINISTRATION  
517

